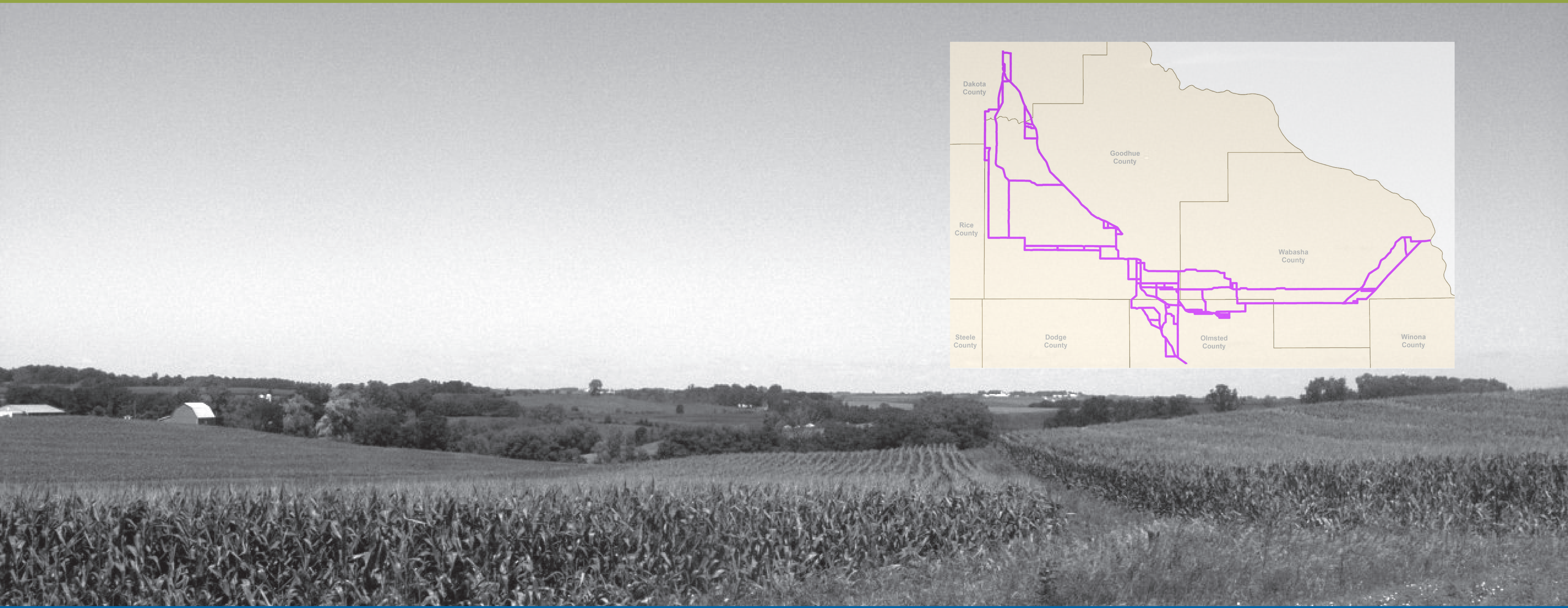
CapX Hampton-Rochester-La Crosse 345kV and 161kV Transmission Lines Project

Draft Environmental Impact Statement



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Abstract

The Public Utilities Commission (Commission) is considering the project proposed by Xcel Energy – on behalf of its CapX2020 co-owners Dairyland Power, Rochester Public Utilities, WPPI Energy and Southern Minnesota Municipal Power Agency – to construct and operate a 345 kilovolt and a 161 kilovolt transmission line between Hampton, Minnesota, Rochester, Minnesota, and La Crosse, Wisconsin. The portion of the project within the state of Minnesota would traverse parts of Dakota, Goodhue, Olmsted and Wabasha counties, with one potential route alternative that runs along the Rice-Goodhue county border. The project also includes the construction and operation of a new substation in an area between Zumbrota and Pine Island, Minnesota.

This draft environmental impact statement (draft EIS) evaluates the portion of the line in the state of Minnesota only, and was produced to satisfy the state of Minnesota environmental review requirements for the project.

Additional information on the project is available in the project application listed in the references chapter of this draft EIS. Other material related to this docket is available online at: http://energyfacilities.puc.state.mn.us/Docket.html?Id=25731, or on the eDockets website at https://www.edockets.state.mn.us/EFiling/search.jsp (enter the docket year “09” and number “1448”).

This draft EIS was released on March 21, 2011. Comments on the draft EIS will be accepted until April 29, 2011. Comments should be sent by email, facsimile, or U.S. mail to:

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Following the comment period, the draft EIS will be revised to incorporate comments and a final EIS will be issued.

This document can be made available in alternative formats (i.e., large print or audio) by calling 651-296-0391 (voice.) Persons with hearing or speech disabilities may call us through Minnesota Relay at 1-800-627-3529 or by dialing 711.

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List of Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
ACSS	Aluminum Conductor Steel Supported (cables)
AIMP	Agricultural Impact Mitigation Plan
ALJ	Administrative Law Judge
AM	Amplitude Modulated
AMA	Aquatic Management Area
APE	Area of Potential Effect
ATF	Advisory Task Force
AWOS	Automated Weather Observation Stations
BFD	Bird Flight Diverters
BMP	Best Management Practice
BWSR	Minnesota Board of Water and Soil Resources
CCD	Colony Collapse Disorder
Commission	Public Utilities Commission
CON	Certificate of Need
CR	County Road
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CSAH	County State Aid Highway
CWA	Federal Clean Water Act
CWCS	Comprehensive Wildlife Conservation Strategy
CWD	Chronic Wasting Disease
dB	Decibels
dBA	"A-weighted" sound scale (human hearing) recorded in units of decibels
DME	Distance Measuring Equipment
DNR	Minnesota Department of Natural Resources
DOT	Minnesota Department of Transportation
ECS	Ecological Classification System
EFP	OES Energy Facilities Permitting
EIS	Environmental Impact Statement
ELF	Extremely Low Frequency
EMF	Electromagnetic Field
EMI	Electromagnetic Interference
EPRI	Electric Power Research Institute
EQB	Environmental Quality Board
EU	European Union
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FEMA	Federal Emergency Management Agency
FM	Frequency Modulated
FMA	Fish Management Area
FNAP	Farmland Natural Areas Project, Dakota County, MN
G	Gauss (mG = milligauss)
GAP	Gap Analysis Program
GBCA	Grassland Bird Conservation Areas
GIS	Geographic Information System
GPS	Global Positioning System
GSM	Global System for Mobile Communications
HPFF	High-Pressure Fluid-Filled Pipe
HU	Hydrologic Unit
HUD	Housing and Urban Development
HVTL	High Voltage Transmission Line
Hwy	Highway
Hz	Hertz
IBA	Important Bird Area
ICD	Implantable Cardioverter Defibrillators
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEEE	Institute of Electrical and Electronics Engineers
kV	Kilovolt
LGU	Local Government Unit
LULC	Land Use/Land Cover
LUST	Leaky Underground Storage Tank
mA	Milliamps
MCBS	Minnesota County Biological Survey
MDA	Minnesota Department of Agriculture
MES	Master Entity System
MHz	Megahertz
MLCCS	Minnesota Land Cover Classification System
MN	Minnesota
Mn Hwy	Minnesota State Highway
MSIWG	Minnesota State Interagency Working Group
MVA	Megavolt-ampere
MW	Megawatt
MWh	Megawatt hour

NAAQS	National Ambient Air Quality Standards
NAC	Noise Area Classifications
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NHIS	Natural Heritage Information System
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NOP	USDA National Organic Program
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRPB	National Radiological Protection Board
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
OES	Office of Energy Security (Department of Commerce)
PCA	Minnesota Pollution Control Agency
PPB	Parts Per Billion
PPSA	Power Plant Siting Act
PSCW	Public Service Commission of Wisconsin
PUC	Public Utilities Commission
PWI	Public Waters Inventory
RIM	Reinvest in Minnesota, MN DNR critical habitat program
RJD Forest	Richard J. Dorer Memorial Hardwood Forest
ROW	Right-of-Way
RPA	Route Permit Application
RUS	U.S. Department of Agriculture Rural Utilities Service
SCGN	Species in Greatest Conservation Need
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SNA	Scientific and Natural Area
SPCC	Spill Prevention, Control, and Countermeasure Plan
SWG	State Wildlife Grants
SWPPP	Stormwater Pollution Prevention Plan
TCP	Traditional Cultural Property
TSR	Township, Section, and Range
US Hwy	U.S. Highway
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDOE	U.S. Department of Energy
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOR	Very High Frequency Omni-directional Radio Range
WCA	Wetland Conservation Act
WHO	World Health Organization
WMA	Wildlife Management Area
WPA	Waterfowl Production Area
WRP	Wetland Reserve Program
XLPE	Extruded dielectric cable system

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Xcel Energy (the applicant) – on behalf of CapX2020 co-owners Dairyland Power, Rochester Public Utilities, WPPI Energy and Southern Minnesota Municipal Power Agency – proposes to construct and operate a 345 kilovolt (kV) and a 161 kV transmission line between Hampton, Minnesota; Rochester, Minnesota; and La Crosse, Wisconsin. To construct and operate the proposed project, CapX2020 must obtain a route permit from the Minnesota Public Utilities Commission (Commission). As part of the route permitting process, the Minnesota Department of Commerce's Office of Energy Security (OES) prepares an environmental impact statement (EIS). Because this project spans the Minnesota-Wisconsin border, it is important to note that this draft EIS evaluates only the portion of the project within the state of Minnesota to satisfy the state's environmental review requirements.

The portion of the 345 kV transmission line within the state of Minnesota is 81 to 89 miles in length, and would traverse parts of Dakota, Goodhue, Olmsted and Wabasha counties. One route alternative under consideration is aligned along the Rice County-Goodhue County border. The project also includes an approximately 15- to 18-mile 161 kV transmission line in Goodhue and Olmsted counties connecting a proposed new substation located between Zumbrota and Pine Island, Minnesota, with the existing Northern Hills Substation north of Rochester, Minnesota.

The stated need of the project is to improve regional reliability of the transmission system, to improve community reliability of the transmission system in specified communities, and to increase generation outlet. The Commission found that this project was needed in order to address these goals in a Commission Order dated May 22, 2009 (as modified August 10, 2009).

The proposed 345 kV transmission line would be constructed primarily with single-pole, self-weathering, rust-colored steel structures, ranging in height from 130 to 175 feet, with an average span of 1,000 feet between poles. The structures would be "double circuit capable," meaning that a second 345 kV circuit could be placed on the structures in the future if warranted. The typical right-of-way (ROW) for the 345 kV transmission line would be 150 feet (generally, 75 feet on each side of the centerline).

The proposed 161 kV transmission line would be constructed primarily with steel, single-pole structures, ranging in height from 70 to 105 feet, with an average span of 400 to 700 feet between poles. The typical ROW for the 161 kV transmission line would be 80 feet.

The proposed project includes construction of a new substation, in an area between Zumbrota and Pine Island, Minnesota, and modifications at two existing substations. The new "North Rochester Substation" would require the acquisition and development of 40 acres for substation infrastructure. Modifications at the existing Hampton (permitted as part of another project) and Northern Hills Substations would occur within the existing substation footprints, and would not require the acquisition of additional land for development.

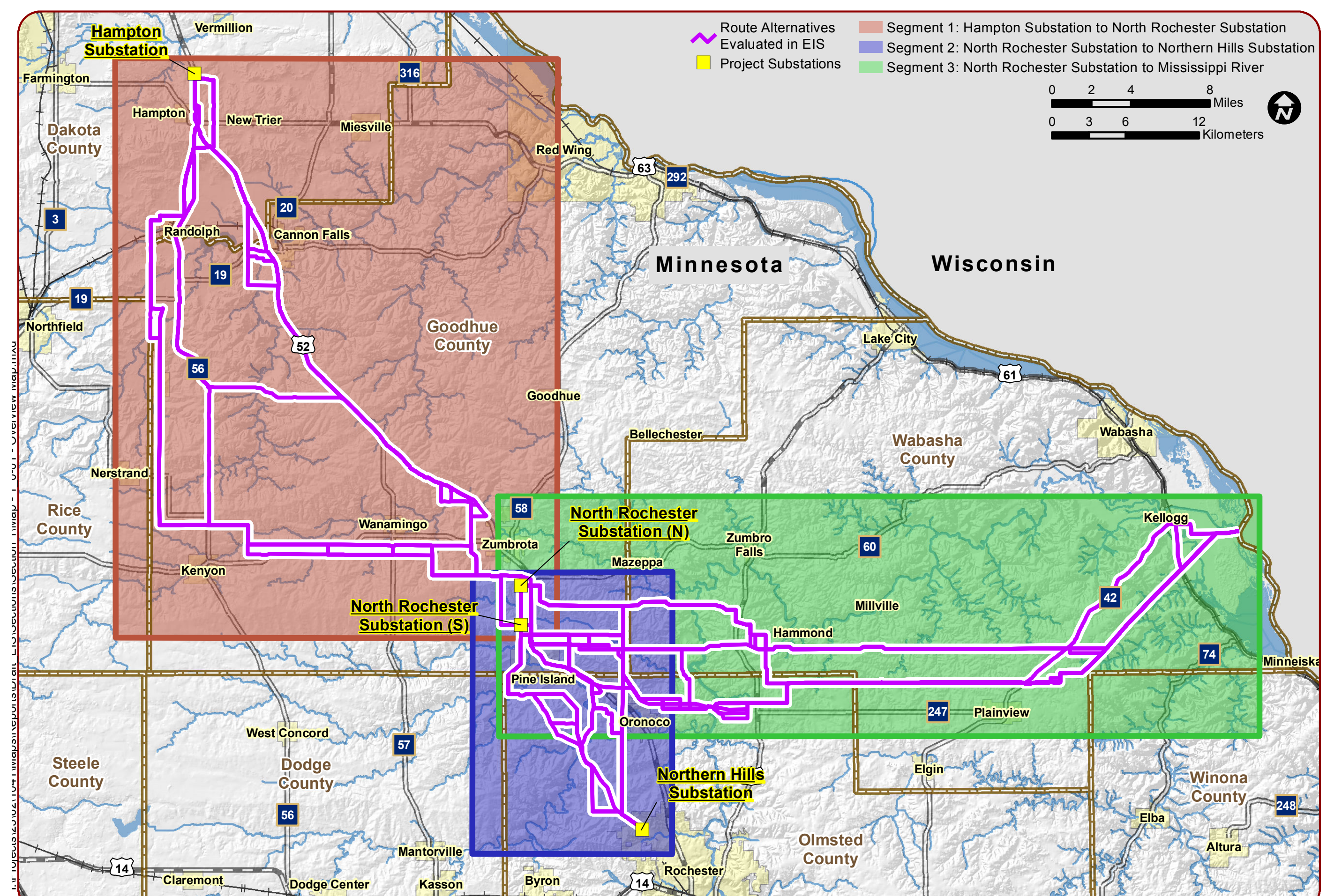
In a route permit application submitted to the Commission on January 19, 2010, the applicant identified two potential routes for both the 345 kV transmission line and the 161 kV transmission line. Minnesota Rules require the applicant to state which of these routes the applicant prefers at the time the route permit application is submitted. It is important to note, however, that while the applicant has a preference for a particular route, the State of Minnesota has no preference for any one route. All route alternatives are evaluated using the same criteria and level of detail. The route permit application also included two additional route options. One, an option for crossing the Zumbro River; the other, an option for avoiding a crossing of the McCarthy Lake Wildlife Management Area, south of Kellogg, Minnesota, in Wabasha County.

For each of the proposed routes and options, the applicant requested a 1,000-foot route width. The route width would represent the permitted area within which a transmission line ROW could be located. In both the route permit application and this draft EIS, however, OES has asked the applicant to identify the intended alignment of the transmission lines and their associated ROWs. The maps in Appendix A of this draft EIS depict the intended alignment, the ROW required and the route width requested.

1.1 State of Minnesota Review Process

Following the applicant's submittal of a route permit application, and prior to beginning work on this document, OES sought comments from the public on the issues and route alternatives that should be evaluated in the EIS and, ultimately, considered by the Commission in their route permitting decision. OES sought comments through two approaches: a public scoping comment period and two advisory task forces. The public scoping comment period was open from April 19, 2010, through May 20, 2010, giving citizens, local governments, state and federal agencies, and other groups the opportunity to suggest issues and route alternatives for Commission consideration. OES also held a series of public information and scoping meetings in locations along the proposed project routes in May 2010. The two advisory task forces consisted of local government officials and members of non-governmental organizations. The two task forces, each representing approximately one-half of the project area, met three times between April and June of 2010, and issued reports to OES in June 2010.

Based on the comments received during the public scoping comment period and at the public meetings, as well as the information provided in the advisory task force reports, the Director of OES finalized the scope of this draft EIS in a scoping decision dated August 6, 2010. Included in the scoping decision were 62 route alternatives to be evaluated in this document in addition to the routes and options proposed by the applicant. Each of these route alternatives is evaluated in this document using the same criteria and level of detail, and is available for Commission permitting consideration.



The draft EIS was prepared by OES to address the issues and route alternatives identified in the scoping decision. Preparation of this document includes desktop and field review of the project area to verify, correct, update and augment the information in the applicant's route permit application, including house locations, numbers of houses within various distances from the routes, airport locations and potential conflicts, as well as natural resource data such as that on public lands, rare species, and wetlands. Potential impacts and mitigation measures along the route segments are described in the document in Sections 7 and 8. Data tables comparing route alternatives in each of the three segments (defined below) are attached to this document in Appendices H, I and J.

OES will seek public comment on the draft EIS during an open public comment period and at a series of public meetings held along the proposed routes following the publication of this document. After the close of the comment period, OES will prepare a final EIS. The final EIS will respond to all timely, substantive comments made on the draft EIS.

Due to the length and capacity of the proposed project, the State review process includes a contested case hearing. Contested case hearings are presided over by an Administrative Law Judge from the Minnesota Office of Administrative Hearings. The final EIS, once published, will be entered into the hearing record. Hearings will be held in locations along the proposed routes, and in St. Paul, Minnesota. Interested persons will have an opportunity at the hearings to ask questions about the proposed project, provide comments, submit evidence, and advocate for the routes and route segments that they believe are most appropriate for the project.

An EIS does not advocate or state a preference for a specific route or route segment. An EIS characterizes, analyzes, and compares routes and route segments such that citizens, governmental units, agencies, and the Commission can work from a common set of facts and, where the facts are in dispute, uncertainties.

1.2 Overview of Draft EIS Contents

The analysis of route alternatives in this draft EIS is divided into three segments, corresponding to the geographic regions between the project's substations:

- Segment 1 - Hampton to North Rochester Substation 345 kV Section
- Segment 2 - North Rochester Substation to Northern Hills Substation 161 kV Section
- Segment 3 - North Rochester Substation to Mississippi River 345 kV Section

The naming convention for route alternatives identifies the segment in which they are located, and whether they are based on the applicant's preferred or alternate routes or a combination of the two. Route alternatives based on the applicant's preferred route are referred to collectively as the "P route alternatives." Route alternatives associated with the applicant's alternate route are referred to as the "A route alternatives." Some route alternatives were proposed that combine elements of both the applicant's preferred and alternate routes. These route alternatives are referred to as "B route alternatives." Certain route alternatives were proposed that involve sharing ROW and creating a parallel alignment between portions of Segments 2 and 3. These are referred to as "C route alternatives." Naming conventions used for the route alternatives are discussed in detail in Section 2.6.

The potential impacts of the various route alternatives in each segment are characterized, analyzed, and compared for each of the three segments using text, maps, figures, and tables. All route alternatives have been evaluated equally, using the same criteria for assessing potential impacts. The discussion of the route alternatives, resources present, and potential project impacts is organized in the draft EIS in the following sections:

- **Section 1** provides a broad summary of the project, the state review process, the contents of the draft EIS, and the issues and impacts associated with the project.
- **Section 2** details the proposed project, including location, route descriptions, and ROW requirements.
- **Section 3** provides information about the regulatory framework for the project, including permitting procedures, public scoping and review processes, hearings before the Administrative Law Judge, and the Commission permitting decision.
- **Section 4** describes the engineering and operation design for the proposed transmission line and associated facilities.
- **Section 5** provides information on proposed construction and maintenance procedures.
- **Section 6** reviews the factors supporting a Kellogg, Minnesota, to Alma, Wisconsin, crossing of the Mississippi River, and provides information on resources in the vicinity of the river crossing.
- **Section 7** provides an overview of the resources in the affected environment common to most route alternatives, as well as a general discussion of potential impacts and impact mitigation along the entire route.
- **Section 8** provides additional detail on the affected environment and potential impacts and mitigation measures specific to each of the route alternatives and substation locations.
- **Section 9** outlines the required permits and approvals for the proposed project.
- **Section 10** provides the document's references.

1.3 Summary of Project Impacts and Route Alternatives

This summary provides a general description of potential impacts of the project and compares, in a broad sense, the relative merits of the route alternatives proposed. Detailed discussion and analysis of potential impacts and route alternatives are found in Sections 7 and 8 of the draft EIS.

Potential Impacts

The proposed transmission line project is of a magnitude such that there will be impacts from its construction and operation. Many, but not all, of these impacts can be mitigated. The impacts can be grouped into two broad categories: (1) impacts to human settlements and economies and (2) impacts to natural resources.

Impacts to human settlements and economies include, but are not limited to, potential impacts to public health and safety, property values, land-based economies (e.g., agriculture), and industry and development. Concerns related to health and safety include electric and magnetic fields (EMF), induction, stray voltage, and potential impacts to implantable medical devices. In general, impacts to public health and safety from the project are not anticipated. Potential impacts to property values are uncertain – property values could decrease, increase, or remain the same. The large number of factors that influence a property's value makes a determination of project impact difficult.

Agricultural activities account for over 70 percent of the land use along route alternatives in the project area. However, agricultural production would be minimally impacted by the project as a very small amount of land would be removed from agricultural production. Farming and grazing activities could continue around and under the proposed transmission lines. Some route alternatives pass through or very near substantial human settlements, e.g., the cities of Cannon Falls, Zumbrota, and Pine Island. These alternatives may impact economic development in these cities.

Impacts to natural resources include, but are not limited to, potential impacts to flora and fauna (potentially including impacts to rare and unique species) and to water and air resources. In general, impacts to flora and fauna will occur, but these impacts can be mitigated and are not anticipated to be significant from a population standpoint. In some instances, impacts can be mitigated by choosing route alternatives which utilize or parallel existing infrastructure. For these alternatives, the impacts of the project are incremental impacts, which are substantially less than those of a new transmission line corridor. All water resources in the project area can be spanned; thus, direct impacts to water resources are not anticipated. Additionally, impacts can be mitigated by crossing water resources at locations where infrastructure already exists, e.g., road, dam, transmission line.

Segment 1 – Hampton to North Rochester Substation 345 kV Section

Route alternatives in this segment can be placed into two groups: (1) those alternatives that generally follow U.S. Highway 52 (P route alternatives) and (2) those that proceed more directly south from Hampton, Minn., along roads and field lines and then eastward to the proposed North Rochester Substation site (A route alternatives). The P route alternatives follow a major highway and take a relatively direct path from Hampton to the proposed substation site. These alternatives have the potential to impact development along Highway 52, and in the cities of Cannon Falls and Pine Island. Additionally, homes, businesses, and schools have located near Highway 52 and in these cities, thus increasing the potential for impacts due to the close proximity of a transmission line. Several route alternatives were proposed for mitigating impacts along Highway 52, e.g., routing around cities and planned development. These alternatives are discussed in Sections 7 and 8.

The A route alternatives avoid potential impacts to the cities along Highway 52. These alternatives proceed along smaller roads and field lines. The A route alternatives have relatively fewer homes within the proposed routes. These alternatives are relatively longer (and thus more expensive) and they do not follow the largest existing infrastructure corridor in the area, Highway 52.

All P and A route alternatives cross the Cannon River. All of the alternatives will impact agricultural production, but these impacts are estimated to be about equal between the alternatives.

Segment 2 – North Rochester Substation to Northern Hills Substation 161 kV Section

Route alternatives in this segment represent a variety of options for connecting the proposed North Rochester Substation to the existing Northern Hills Substation. All of the alternatives use existing infrastructure corridors (e.g., transmission line, state trail), though the alternatives vary in the type and extent of corridor utilized.

The Douglas State Trail is a multiple use trail and existing corridor that runs, generally, from Pine Island to Rochester. All of the route alternatives in this segment propose to parallel some portion of this trail; the amount paralleled varies with the route alternative. These alternatives may impact some users enjoyment of the trail.

As the proposed North Rochester Substation will connect to a 345 kV and a 161kV transmission line, several route alternatives were proposed that place these lines next to each other for some distance, in an attempt to share transmission line ROW and to reduce the proliferation of lines (these routes are noted as "C route alternatives," to indicate their combined nature, see Section 2.6 for a discussion of naming conventions). These alternatives have the potential to reduce the proliferation of transmission lines in the North Rochester Substation area, i.e., in and around the cities of Zumbrota and Pine Island. The combined ROW for the parallel lines would allow sharing of 30 feet of ROW between the two lines, reducing the combined ROW to 200 feet.

Segment 3 - North Rochester Substation to Mississippi River 345 kV Section

Route alternatives in this segment include three options for crossing the Zumbro River before proceeding eastward to a crossing of the Mississippi River at Kellogg, Minnesota. The northern alternative for crossing the Zumbro does not utilize an existing infrastructure corridor. The central alternative utilizes the Zumbro Dam (Zumbro Dam crossing); the southern alternative utilizes a bridge over the Zumbro River (White Bridge Road crossing). A number of route alternatives were proposed to connect the North Rochester Substation site to one (or more) of these three river crossing segments. As in Segment 2, some alternatives propose to co-locate the 345 kV line of Segment 3 (before it proceeds eastward) and the 161 kV line of Segment 2 for some distance. All of the route alternatives, as they proceed to the Mississippi River, will impact agricultural production, but these impacts are estimated to be about equal between the alternatives.

As the route alternatives approach the blufflands of the Mississippi, there are two alternatives for proceeding: (1) following (and replacing) an existing 161 kV transmission line corridor and (2) following State Highway 42. Both of these alternatives proceed eastward to the Mississippi River crossing. Near the river crossing, they encounter three features which could be affected by the transmission line – (1) U.S. Highway 61, which is the Great River Road National Scenic Byway, (2) McCarthy Lake Wildlife Management Area (WMA), and (3) the city of Kellogg, Minnesota.

There is an existing 161 kV transmission line (and a route alternative) through the McCarthy Lake WMA. This route alternative would place the existing 161 kV transmission line on new structures with the 345 kV line. These new structures would require an expansion of the existing ROW through the WMA. Thus, this route alterative would have an incremental impact on natural resources in the WMA. Use of this alternative would minimize impacts to the Great River Road, as the crossing of the Great River Road would be perpendicular and utilize an existing transmission line corridor.

A route alternative was proposed which avoids the McCarthy Lake WMA by going around its northern edge. This alternative minimizes impacts to the WMA but runs parallel to the Great River Road. This alternative would have relatively greater impacts on the Great River Road. Another route alternative follows State Highway 42 to a point just south of Kellogg, Minnesota. This route alternative avoids a crossing of the WMA, and would create a new, perpendicular crossing of the Great River Road.

The route alternative following State Highway 42 would involve impacts to the city of Kellogg and to residents along the highway.

All of the route alternatives in Segment 3 cross the Mississippi River east of Kellogg, Minnesota, across the USFWS-managed Upper Mississippi River National Wildlife and Fish Refuge, to a location in Alma, Wisconsin. This stretch of the Mississippi River is one of the four primary bird migration routes in North America. There is an existing 161 kV transmission line which crosses the river at this location. If the river is crossed aerially, the new 345 kV and the existing 161 kV line would share transmission line towers. The new 345 kV line has the potential for an incremental impact to flora and fauna, particularly avian species. These impacts can be mitigated to some extent by design, e.g., placing the conductors in a minimum number of vertical planes. An underground crossing of the river would mitigate this incremental impact. If the 345 kV line was undergrounded, the structures and lines of the existing 161 kV line would remain at the crossing. An underground crossing, due to the nature of the structures required, would likely create more land-based flora and fauna impacts than an aerial crossing. Such a crossing would also be more expensive than an aerial crossing.

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This section of the draft environmental impact statement (EIS) provides basic information about who is proposing to build the transmission line, why they are proposing it, and an overview of what is being proposed, including the routes, right-of-way (ROW) requirements, and estimated cost.

2.1 The Applicant

Xcel Energy is a Minnesota corporation headquartered in Minneapolis, Minnesota, and is a wholly-owned subsidiary of the utility holding company Xcel Energy Inc. Xcel Energy provides electricity services to approximately 1.2 million customers and natural gas services to 425,000 residential, commercial, and industrial customers in the state. Xcel Energy has applied for a route permit from the Minnesota Public Utilities Commission (Commission) on behalf of CapX2020, a joint initiative of 11 transmission-owning utilities in Minnesota, Wisconsin, and the surrounding region.

What is CapX2020?

CapX2020 is a joint initiative of regional electric utilities to satisfy increasing demand for electricity in the region by constructing new high-voltage transmission lines (HVTLs). The initiative is made up of 11 transmission-owning utilities in Minnesota, Wisconsin, and the surrounding region: Great River Energy, Xcel Energy, Central Minnesota Municipal Power Agency, Dairyland Power Cooperative, Minnesota Power, Minnkota Power Cooperative, Missouri River Energy Services, Otter Tail Power Company, Rochester Public Utilities, Southern Minnesota Municipal Power Agency, and Wisconsin Public Power.

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2.2 The Project

Xcel Energy (applicant) proposes to construct and operate a new 81 to 89-mile, 345 kilovolt (kV) transmission line and a 15 to 18-mile, 161 kV transmission line in Minnesota. The 345 kV line would begin south of the Twin Cities metro area near Hampton, head southeast towards Rochester, and then turn east towards Kellogg, Minnesota, where it crosses the Mississippi River into Wisconsin (see Map 2.5-01). At that point, the line continues from Alma, Wisconsin to the project terminus near La Crosse, Wisconsin. Only the Minnesota portion of the project is the subject of review in this draft EIS. The state of Wisconsin is preparing a separate EIS for the Wisconsin portion. The 345 kV transmission line will be built using double circuit capable poles. However, only one circuit would be installed for this project. The 161 kV transmission line would begin at a proposed new substation to be located between Zumbrota and Pine Island to the existing Northern Hills substation north of Rochester.

The applicant has proposed two possible routes for the 345 kV transmission line; these are designated as the applicant's preferred route (P route) and the applicant's alternate route (A route). Similarly, the applicant has proposed two possible routes for the 161 kV transmission line; these are designated as the applicant's preferred route and alternate route for that component of the project. The combined 345 kV and 161 kV routes would cross portions of the following counties: Dakota, Goodhue, Olmsted and Wabasha. The project would also include the construction of a new North Rochester Substation and improvements to the existing Hampton and Northern Hills Substations.

The Wisconsin portion of the project will be permitted in a separate proceeding before the Public Service Commission of Wisconsin (PSCW).

2.3 Project Purpose

The purpose of the Hampton - Rochester - La Crosse transmission line project is to: (1) Improve community reliability of the transmission system in Rochester, Winona, La Crosse, and the surrounding areas; (2) Improve the regional reliability of the transmission system; and (3) Increase generation outlet capacity.

The Commission determined that the project was needed and granted a Certificate of Need (CON) for the project on May 22, 2009.

2.4 General Route Descriptions

The applicants' preferred and alternate routes, as shown in Map 2.5-01, are discussed in this draft EIS in three segments. Detailed turn-by-turn descriptions of the preferred and alternate routes, as well as route alternatives proposed by the public during the scoping process are provided in Section 8 of the draft EIS. Generally, the three segments of the project are as follows:

- **Segment 1 - Hampton to North Rochester Substation 345 kV Line**
  The 345 kV transmission line would originate at the Hampton Substation and continue to the proposed North Rochester Substation. The proposed substation would be constructed somewhere west of U.S. Highway 52, south of State Highway 60 and north of 500th Street in southern Goodhue County. The length of this segment is 36 to 47 miles, depending on the specific route selected, and passes through Dakota and Goodhue Counties.

- **Segment 2 - North Rochester Substation to Northern Hills Substation 161 kV Line**
  The 161 kV transmission line would originate at the proposed North Rochester Substation and would terminate at the existing Northern Hills Substation. The length of this segment would be 15 to 18 miles, depending on the specific route selected, and would pass through Goodhue and Olmsted Counties.

- **Segment 3 - North Rochester Substation to Mississippi River 345 kV Line**
  The 345 kV transmission line would continue from the proposed North Rochester Substation, cross the Zumbro River and terminate at a substation near La Crosse, Wisconsin. The transmission line would cross the Mississippi River at a location near Kellogg, Minnesota and Alma, Wisconsin. The length of this segment is 42 to 45 miles, depending on the specific route selected, and passes though Goodhue, Olmsted and Wabasha Counties.

2.5 Associated Facilities

The proposed project includes expansion or construction of three substations.

- **Hampton Substation (Under Construction)**
  Construction of the Hampton Substation was approved by the Commission on September 14, 2010, as part of the Brookings County-Hampton project, Docket No. ET/TL-08-1474. The substation will be located on the west side of Highway 52 near 215th Street, and on the north side of 215th Street. The substation fenced and graded area will be approximately five to eight acres, with approximately 32 to 35 additional acres to provide an adequate buffer and to accommodate transmission line connections to the substation. The substation will be constructed with one 345 kV breaker and

What is a substation?

A substation connects two or more transmission lines and may increase or decrease the voltage, by use of a transformer, as required. It may also interconnect with lower-voltage distribution lines, which deliver power to the customer. Between the generating plant and the end-user, power may go through several substations.

a half-yard with nine breaker positions and five breakers. The substation will require line switches, a control house, relay panels, foundations, and steel structures. The substation yard will require graded access roads.

- **North Rochester Substation (Proposed)** The project would include construction of a new North Rochester Substation located in the area between Zumbrota and Pine Island, Minnesota. Approximately 8 acres of fenced area would be required for the substation construction; however, a total of approximately 40 acres would be required to provide adequate buffer and to allow for transmission lines to connect to the substation. The new substation would include six 345 kV circuit breakers, a 345 kV/161 kV transformer, three 161 kV circuit breakers, a control house and associated line termination structures, switches, buswork, controls, and associated equipment. The substation siting area for the proposed North Rochester Substation would accommodate the applicant's preferred or alternate routes. The substation would be designed to connect with the existing Prairie Island – Byron 345 kV transmission line. Detailed plans for the proposed North Rochester Substation depend on the final route selection and final substation site location, as permitted by the Commission.

- **Northern Hills Substation (Existing – Proposed Expansion)** The project would require an approximate 0.5 acre expansion of the existing Northern Hills Substation to accommodate the new 161 kV transmission line and related equipment. No additional property would be required to construct the expansion. Improvements would include an expansion of the existing graded area by approximately 30 feet and the addition of 161 kV equipment, including one circuit breaker and associated line termination switches and controls. Construction would include the associated line switches, foundations, steel structures, and control panels.

What is a route?

The term "route" refers to the pathway that a HVTL follows between end points. Under the Minnesota Power Plant Siting Act (PPSA), a route granted to a utility may have a variable width of up to 1.25 miles. For this project, the requested route is typically 500 feet on either side of the proposed transmission centerline (1,000 feet total). Requesting a larger route width during the permitting phase provides the utility with the flexibility to work closely with landowners to develop detailed pole placements that minimize human and environmental impacts.

2.6 Labeling Convention for Route Alternatives

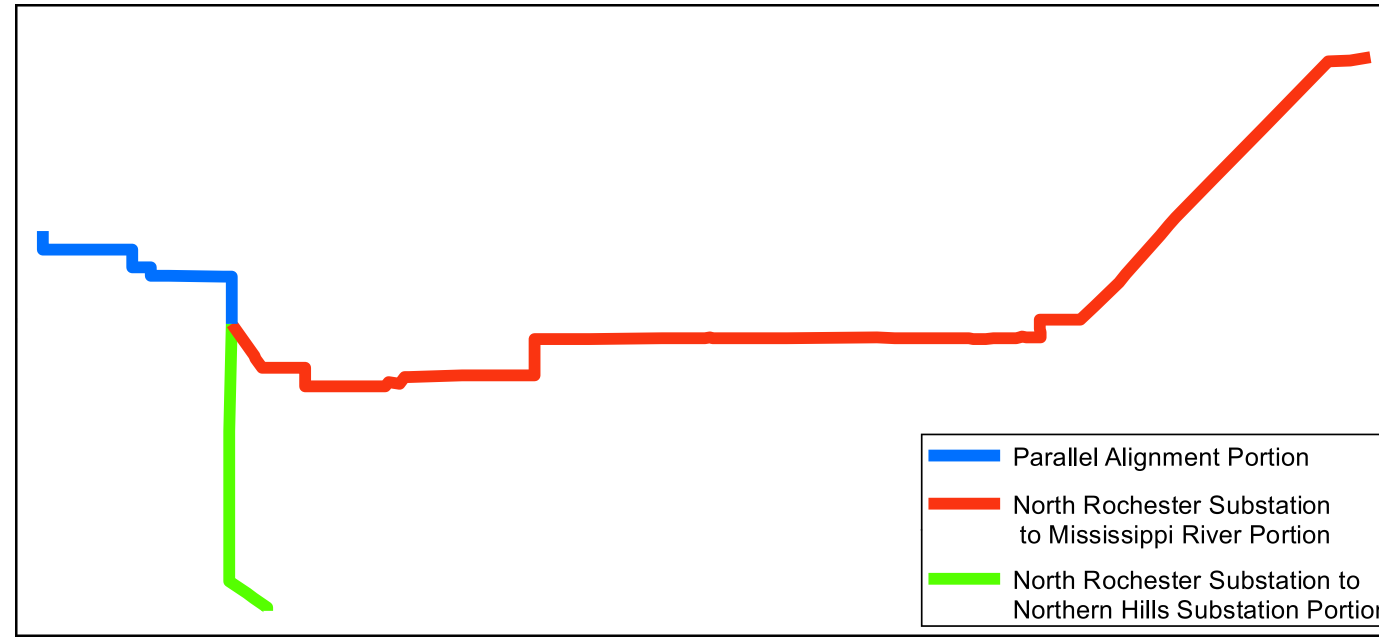
A total of 62 route alternatives are considered in this draft EIS. The route alternatives were evaluated within the three segments described above in Section 2.4. The applicant's preferred routes in Segments 1 through 3 are labeled 1P, 2P and 3P, respectively. The applicant's alternate routes in Segments 1 through 3 are labeled 1A, 2A and 3A, respectively. Naming of the remaining route alternatives is based on three factors. These include:

- Whether the proposed route alternative is based on the applicant's preferred route, the applicant's alternate route, or a combination of the two;
- The segment, as listed above, in which the route alternative is located.
- Whether a route alternative involves parallel alignments of portions of Segments 2 and 3.

The following are examples of route alternative names based on the naming convention described above:

- 1P-002 – This refers to a route alternative in Segment 1 (Hampton to North Rochester Substation) which is a variation on the applicant's preferred route. It is the second such variation proposed during scoping.
- 3A-004 – This is a route alternative in Segment 3 (North Rochester Substation to Mississippi River) based on the applicant's alternate route. It is the fourth route alternative in Segment 3.
- 2B-001 – This is a route alternative in Segment 2 (North Rochester Substation to Northern Hills Substation) that initially follows the applicant's preferred route before switching to the applicant's alternate route.

Figure 2.6-1 "C routes" showing parallel alignment portion



Within the Hampton Substation to North Rochester Substation Segment, there are a total of 17 route alternatives. See Map 2.6-01 for an overview of the Hampton Substation to North Rochester Substation Segment route alternatives.

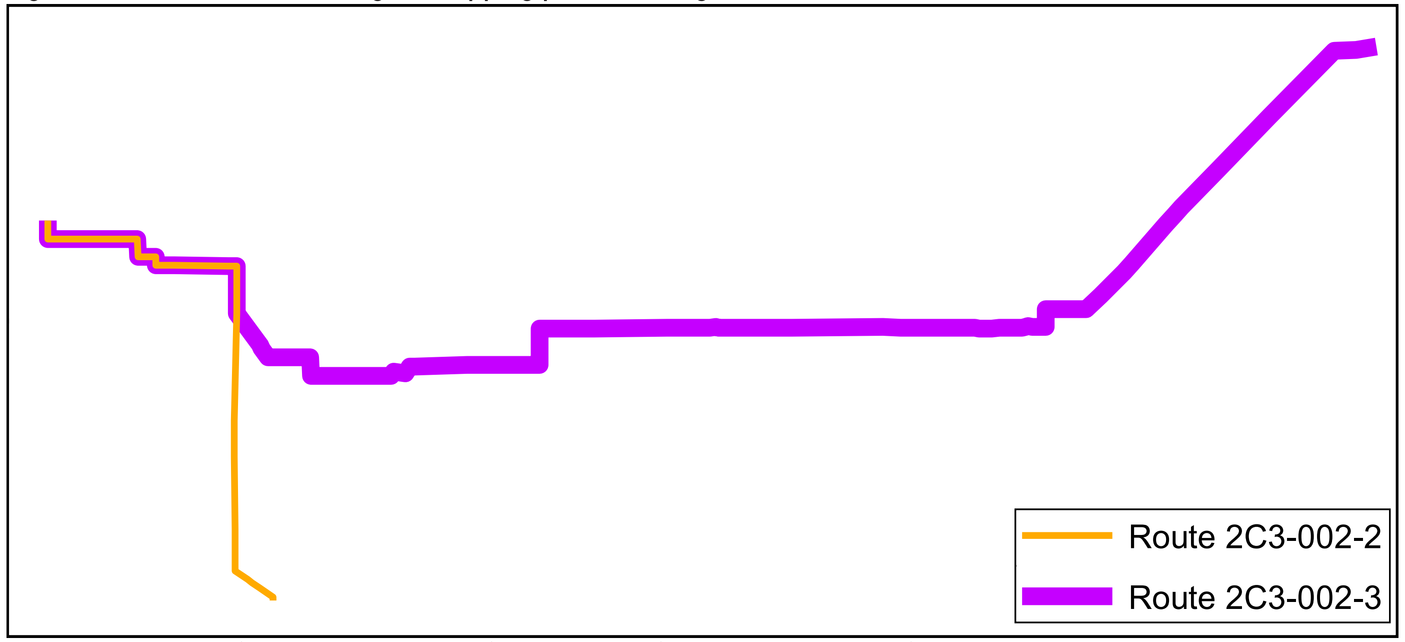
Within the North Rochester Substation to Northern Hills Substation Segment, there are a total of 14 route alternatives. See Map 2.6-02 for an overview of the North Rochester Substation to Northern Hills Substation Segment route alternatives.

Within the North Rochester Substation to Mississippi River Segment, there are a total of 31 route alternatives. See Map 2.6-03 for an overview of the North Rochester Substation to Mississippi River Segment route alternatives.

There were also eight route alternatives proposed during the scoping process that included sharing ROW and creating a parallel alignment between portions of the North Rochester Substation to Northern Hills Substation Segment and the North Rochester to Mississippi River Segment. These are referred to as "C routes." In these cases the route alternatives' names have the form "2C3-00x-x". These proposed route alternatives actually comprise two route alternatives, one for the North Rochester Substation to Mississippi River Segment and one for the North Rochester Substation to Northern Hills Substation Segment. A part of each of these route alternatives overlap in the parallel alignment portion. See Figures 2.6-1 and 2.6-2 for an example. Each of the two portions is given a unique name; in this case, 2C3-002-2 for the North Rochester Substation to Northern Hills Substation portion and 2C3-002-3 for the North Rochester Substation to Mississippi River portion.

In these route alternatives, the 161 kV line and the 345 kV line would be double-circuited at the east end of the route alternatives to the North Rochester Substation. The 161 kV line would continue south to the Northern Hills Substation, and the 345 kV line would continue east to the Mississippi River. Because of the overlap, impacts in the double-circuited/parallel alignment portion

Figure 2.6-2 "C routes" showing overlapping portion of Segments 2 and 3



Alternatives 2C3-002-2 (161 kV line in Segment 2) and 2C3-002-3 (345 kV line in Segment 3). Note overlapping portion where impacts are counted for each segment.

(in blue) are double counted, once in Section 8.2 (for the 161 kV line) and once in Section 8.3 (for the 345 kV line). For an accurate comparison of these route alternatives, the impacts for the overlapping section would have to be subtracted from the total impact of that combination of Segment 2 and Segment 3. The calculated impacts for the overlapping portions are provided in Appendices I and J.

Impacts associated with all route alternatives have been evaluated using the same criteria. Existing resources and potential impacts for all route alternatives are described in detail in Section 8, and are depicted on maps located in Appendix A. Detailed turn-by-turn descriptions of all route alternatives are also provided in Section 8.

2.7 Route Width

Minnesota's Power Plant Siting Act (PPSA) directs the Commission to locate transmission lines in a manner that "minimize[s] adverse human and environmental impact while ensuring continuing electric power system reliability and integrity and ensuring that electric energy needs are met and fulfilled in an orderly and timely fashion." Minn. Stat. § 216E.02, subd. 1. The PPSA further authorizes the Commission to meet its routing responsibility by designating a "route" for a new transmission line when it issues a route permit. The route may have "a variable width of up to 1.25 miles," within which the ROW for the facilities can be located.

The purpose of the route permitting process is not to establish an exact centerline for a transmission line but rather to establish a general alignment that best balances competing land uses and minimizes human and environmental impacts. Once a route is established by the Commission, the utility then does more detailed engineering and contacts landowners to gather additional detailed information about the circumstances of their property. Only after considering all inputs does the utility establish an exact centerline and pole placement. A route designation by the Commission should be wide enough to provide flexibility for the utility to work with landowners to adjust final design. Once the utility establishes a centerline and structure placement, construction drawings are provided to the Commission so the Commission can confirm the utility's plans are consistent with the route permit. At the same time, a route designation cannot be so wide that it is unclear what the intended general alignment of the transmission line is meant to be.

What is the difference between a route and the right-of-way?

The permitted route described in this section is the area in which the utility is allowed to complete final design. The right-of-way (ROW), on the other hand, is the specific area that is actually required for the final easement for the transmission line. In this case the applicants have asked for a 1,000-foot route in most areas. However, the ROW actually needed for the transmission line facilities is only 150 feet wide, and even less (about 60 feet) when the transmission line can share ROW with other infrastructure such as roads or highways. Requesting a route width wider than the actual ROW needed gives the utility flexibility to make alignment adjustments to work with land-owners and avoid sensitive natural areas.

For this project, the applicant proposes a route width of 1,000 feet for the majority of the project.

The applicant has requested a route width of up to 1.25 miles in the following areas to address site specific concerns:

Applicant's Preferred Route

- Along U.S. Highway 52 where the Minnesota Department of Transportation (DOT) is considering building new highway infrastructure such as interchanges or railroad overpasses.
- Along U.S. Highway 52 north of Cannon Falls and east of the highway for approximately 1 mile where Farmland Natural Areas Program (FNAP) easements exist adjacent to the preferred side of the highway.
- At the proposed North Rochester Substation siting area, which is between Zumbrota and Pine Island, Minnesota. A total of approximately 40 acres would be required for the substation, adequate buffer area, and to allow for transmission lines to connect to the substation.

Applicant's Alternate Route

- In the vicinity of the proposed North Rochester Substation siting area, the applicant has requested a routing area approximately 3,600 feet wide east to west and approximately 3.75 miles long north to south. The western boundary is 500 feet west of the existing Prairie Island to Byron 345 kV line and the eastern boundary is 500 feet east of the centerline of US-52.
- At the proposed North Rochester Substation (see above).

2.8 Rights-of-Way

The majority of the new 345 kV and 161 kV transmission line facilities would be built with single pole structures. A 150-foot-wide ROW is typically required for 345 kV transmission lines, and an 80-foot-wide ROW is typically required for 161 kV transmission lines. In some limited instances, where specialty structures are required for long spans or in environmentally sensitive areas, up to 180 feet of ROW may be needed for the transmission line. Along some route alternatives, the 345 kV line and the 161 kV line would run parallel to each other but on separate structures. In this configuration, the two lines can share 30 feet of ROW, for a total ROW width of 200 feet.

When the transmission line is placed across private land, a ROW agreement is required, typically an easement (see Appendix C). When the transmission line parallels other existing infrastructure (e.g., roads, railroads, other utilities), an easement of lesser width may be required from a landowner, as part of the ROW of the existing infrastructure can often be shared with the ROW needed for the transmission line. When paralleling existing ROW, utilities' typical routing practice is to place the poles on adjacent private property, a few feet off the existing ROW.

With this pole placement, the transmission line shares the existing ROW, thereby reducing the size of the easement required from the private landowner. For example, if the required ROW is 150 feet and the pole is placed five feet off of an existing road ROW, only an 80-foot easement would be required from the landowner and the additional 70 feet of the needed ROW would be shared with the road ROW.

The arms on the transmission line pole (davit arms) would be approximately 85 feet above the ground depending on span length, and extend approximately 18 feet from the center of the pole.

In each instance of ROW sharing, the applicant must acquire necessary approvals from the ROW owner (e.g., railroad) or the agency overseeing use of a particular ROW (e.g., DOT).

Throughout the route development process, the applicant has sought to identify areas to share ROW with existing infrastructure, including transmission lines, highways, and railroads. The PPSA, the Commission's routing rules, and prior judicial decisions recognize this preference and call upon the Commission to consider the utilization of existing linear corridors, particularly existing transmission line corridors and highway ROW.

Among the potential ROW sharing opportunities identified for the 345 kV line is along U.S. Highway 52. This route parallels U.S. Highway 52 for approximately 27 miles between the Hampton Substation and a point northwest of Zumbrota. DOT requires that a utility obtain a utility permit to construct transmission facilities across or in State trunk highways (interstate and non-interstate). Minn. Rule 8810.3300, Subp. 1.

Table 2.9-1 Estimated transmission line construction costs, 345 kV applicant's preferred route and alternate route

345 kV Route Section	Total Cost – Applicant's Preferred Route (millions)[1]	Total Cost – Applicant's Alternate Route (millions)[1]
Hampton – North Rochester Substation	$88	$101
North Rochester Substation- Mississippi River	$106	$101
End-to-end total	**$194**	**$202**

[1]Transmission costs include materials, engineering, survey, ROW, and project management in 2009 dollars.

Table 2.9-2 Estimated transmission line construction costs, 161 kV applicant's preferred route and alternate route

161 kv Route Section	Total Cost – Applicant's Preferred Route (millions)[1]	Total Cost – Applicant's Alternate Route (millions)[1]
161 kV Route Section	$16	$17

[1]Transmission costs include materials, engineering, survey, ROW, and project management in 2009 dollars.

Table 2.9-3 Substation modifications and construction cost estimate

Substation	Status	Total Cost[1]
Hampton	Being permitted and constructed under Brookings-Hampton project	$0
North Rochester Substation	New	$22
Northern Hills Substation	Modified Existing	$2
Total		**$24**

[1]Transmission costs include materials, engineering, survey, ROW, and project management in 2009 dollars.

2.9 Estimated Project Cost

Project construction costs include the survey, engineering, materials, construction, ROW, and project management associated with the transmission line and substation construction. Project costs (estimated in 2009 dollars) are summarized in Tables 2.9-1, 2.9-2, and 2.9-3. The total cost of the Project is between $234 million and $243 million.

2.9.1 Operation and Maintenance

Once constructed, the primary operating and maintenance cost for the transmission lines is the cost of inspections, usually done monthly by air and by ground once a year. Annual operating and maintenance costs for transmission lines in Minnesota and the surrounding states vary depending upon the setting, the amount of vegetation management necessary, storm damage occurrences, structure types, materials used, and the transmission line's age. For 161 kV and 345 kV transmission lines, past experience has shown that costs are approximately $300 to $500 per mile.

Substations require a certain amount of maintenance to keep them functioning in accordance with accepted operating parameters and the National Electric Safety Code (NESC). Transformers, circuit breakers, batteries, protective relays and other equipment need to be serviced periodically in accordance with the manufacturer's recommendation. The site itself must be kept free of vegetation and drainage must be maintained.

2.10 Applicant's Schedule

The applicant's expected permitting and construction schedule for the project is outlined below:

Minnesota Certificate of Need
Completed May 22, 2009

Minnesota Route Permit
Fall 2011

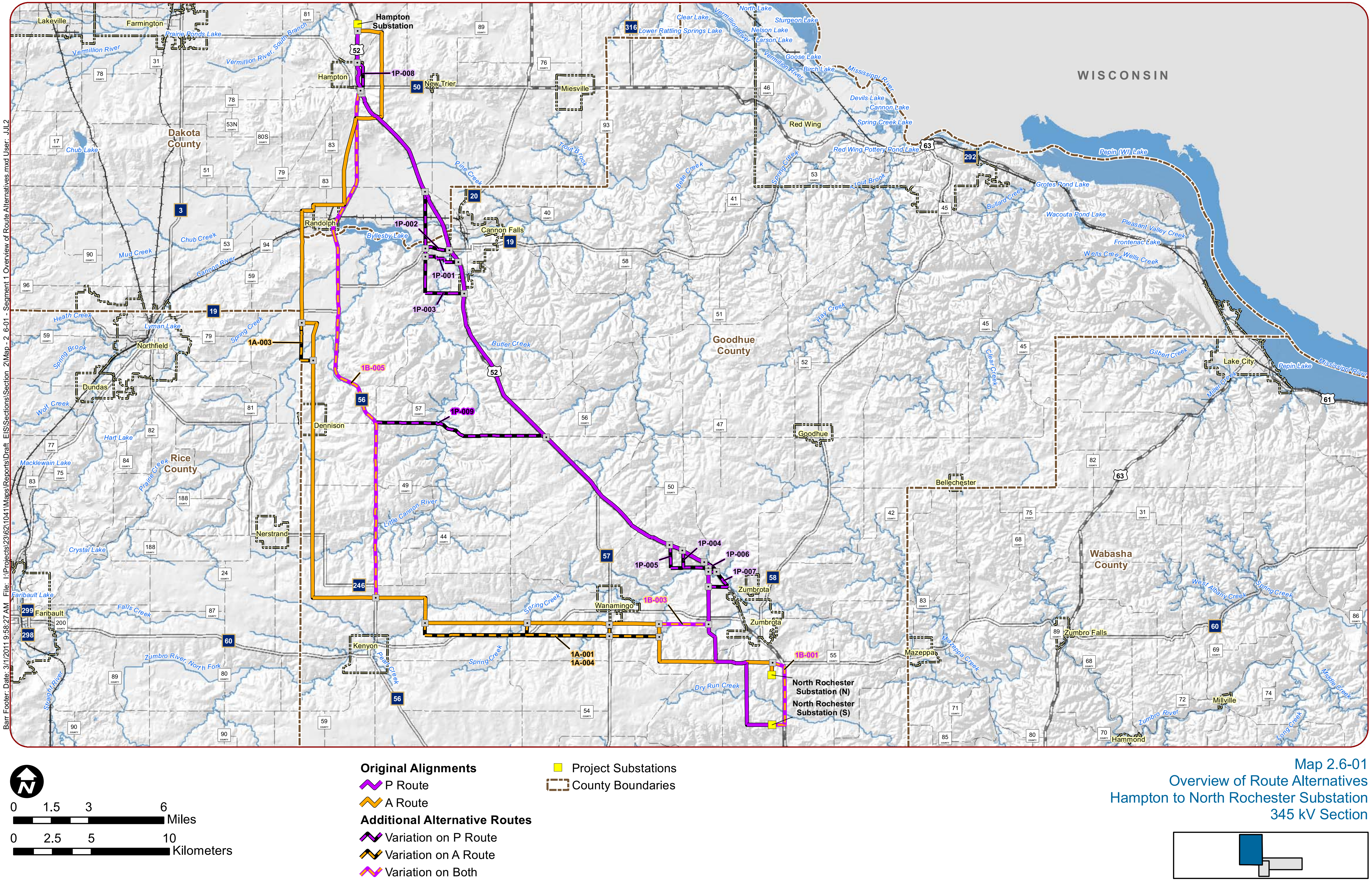
Wisconsin Certificate of Public Convenience and Necessity
First Quarter 2012

Federal Environmental Impact Statement
Spring 2011

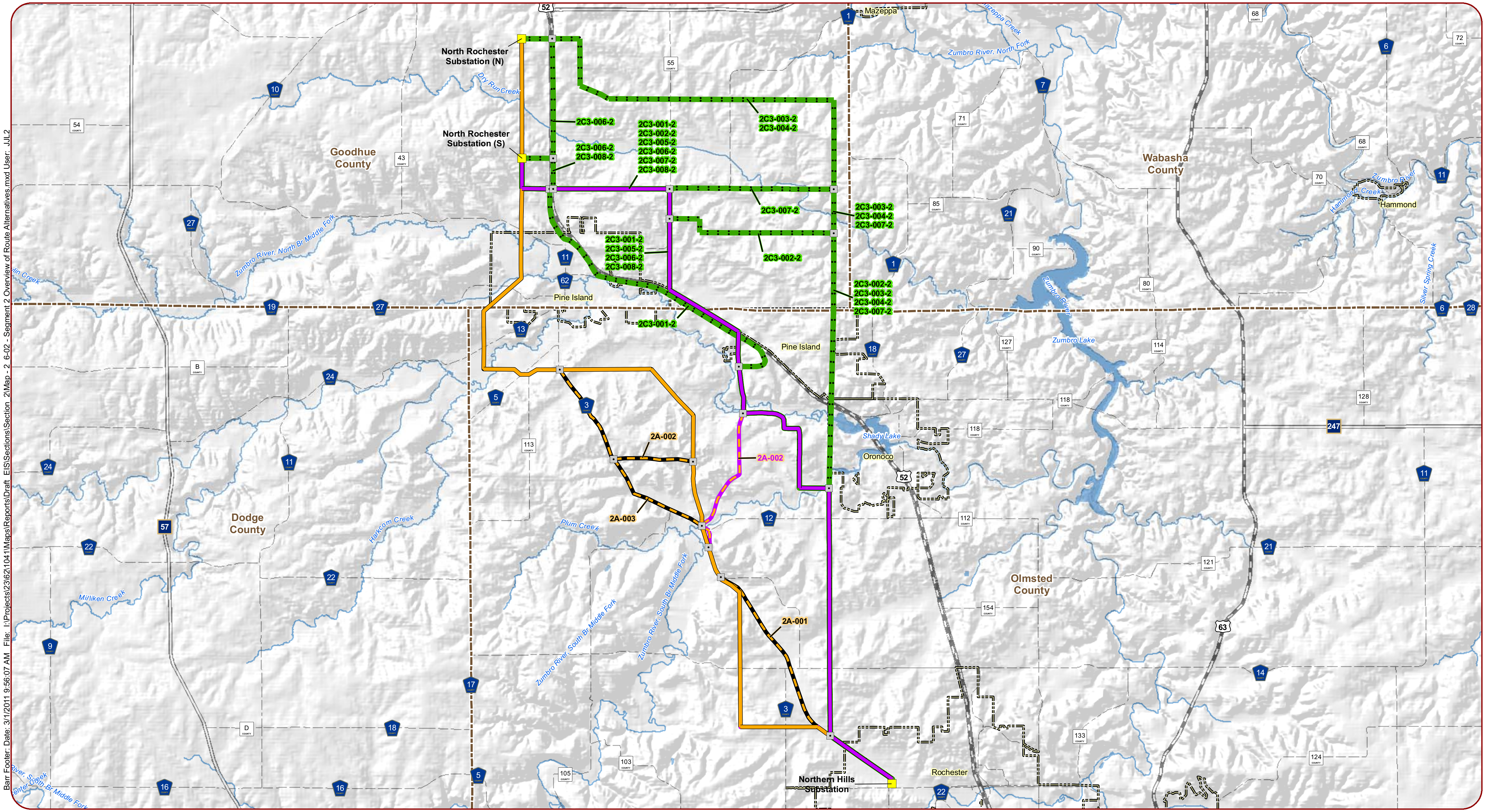
Pre-Construction Activities
Second Quarter 2012 to Third Quarter 2012

Construction
Third Quarter 2012 to Fourth Quarter 2015

Project Completion
Fourth Quarter 2015



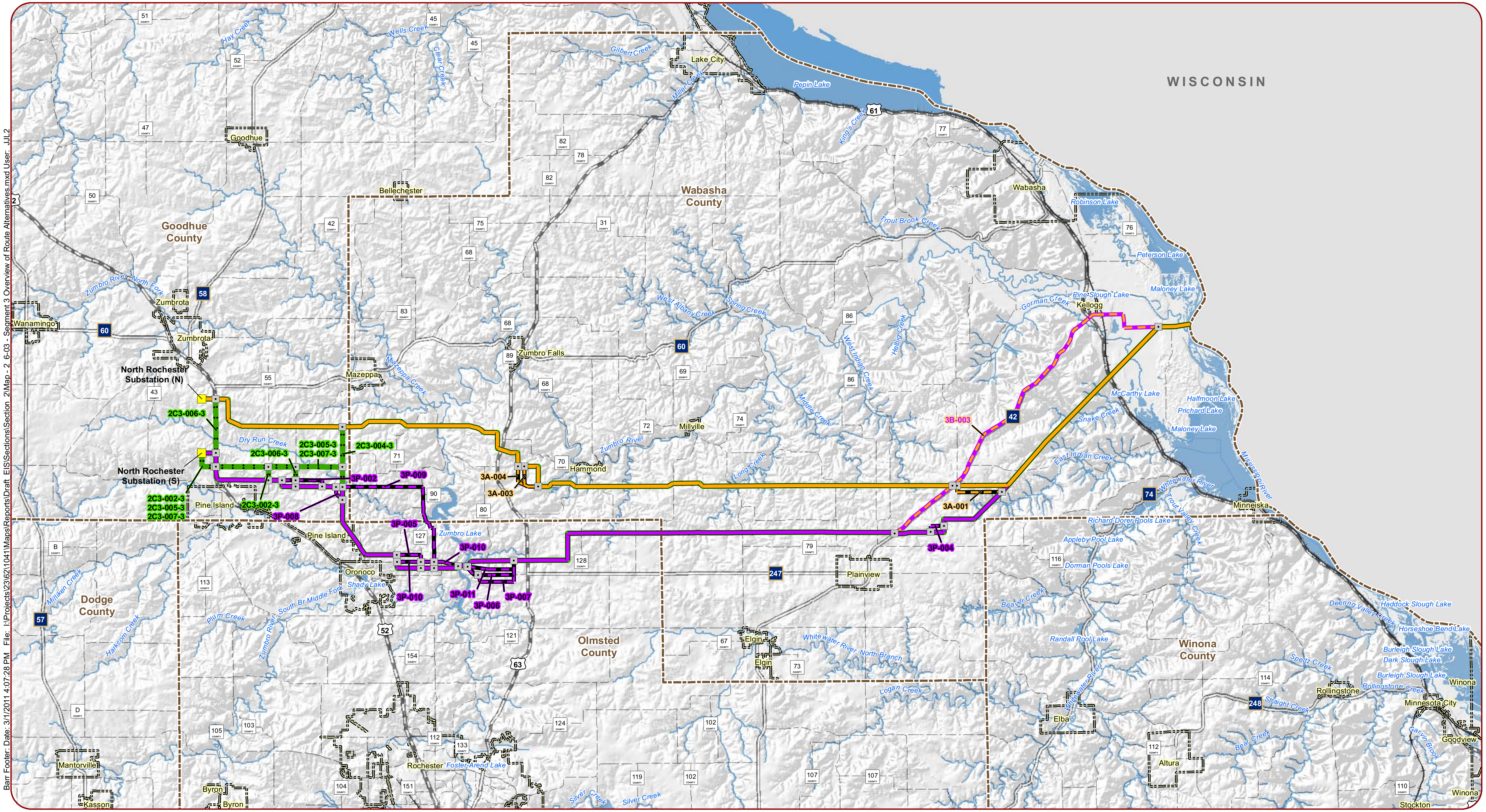
Map 2.6-01
Overview of Route Alternatives
Hampton to North Rochester Substation
345 kV Section



Original Alignments
P Route
A Route
Additional Alternative Routes
Variation on A Route
Variation on Both
Parallel Alignment
Project Substations
County Boundaries

0 1.5 3 Miles
0 2.5 5 Kilometers

Map 2.6-02
Overview of Route Alternatives
North Rochester Substation to Northern Hills Substation
161 kV Section



A Route
P Route
Additional Alternative Routes
Variation on P Route
Variation on A Route
Variation on Both
Parallel Alignment

Project Substations
County Boundaries

0 1.5 3 6 Miles
0 2.5 5 10 Kilometers

Map 2.6-03
Overview of Route Alternatives
North Rochester Substation to Mississippi River
345 kV Section

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The State of Minnesota requires two major approvals before a high-voltage transmission line (HVTL) can be built: a certificate of need (CON) and a route permit.

The Minnesota Public Utilities Commission (Commission) is responsible for making the final decision on both the CON and the route permit. The Office of Energy Security (OES) Energy Facility Permitting (EFP) staff is responsible for conducting the environmental review of a project and preparing an environmental review document. For this project, the document is a draft environmental impact statement (EIS). The final EIS must be found adequate before the Commission can make a final decision on a route permit.

What is the Minnesota Public Utilities Commission?

The Minnesota Public Utilities Commission (Commission) regulates the electricity, natural gas and telephone service industries in Minnesota. Their mission is to create and maintain a regulatory environment that ensures safe, reliable, and efficient utility services at fair and reasonable rates. The Commission makes the final decision on the need for the transmission line as well as its final route.

The CON process is designed to evaluate the need for a large energy project (e.g., a HVTL) in Minnesota, and determine if the project is in the public interest. Evaluation factors include, but are not limited to, (1) whether there are other reasonable alternatives to constructing the facility (including not building the facility), (2) for transmission lines, the best locations for the transmission line to begin and end, and (3) potential environmental impacts of the proposed facility and alternatives. In issuing a CON, the Commission determines the basic types of facility to be constructed, the size of the facility, and when the facility is projected to be in service. The CON process typically takes 12 months to complete.

The route permitting process is designed to locate HVTLs in an orderly manner compatible with environmental preservation and the efficient use of resources. In deciding on a route, the Commission considers locations that minimize adverse human and environmental impacts and costs while ensuring continued electric power system reliability and integrity.

What is a High-Voltage Transmission Line?

Under the Minnesota Power Plant Siting Act (PPSA), a high-voltage transmission line (HVTL) is defined as any conductor of electric energy and associated facilities designed for and capable of operating at a voltage of 100 kV or more and is greater than 1,500 feet in length. Associated facilities include, but are not be limited to, insulators, towers, substations, switches, and terminals.

3.1 Certificate of Need Process

Minnesota Statutes Section 216B.243 states that a CON is required to site or construct a "large energy facility" in Minnesota. A "large energy facility" is defined in Minnesota Statutes Section 216B.2421 as "any HVTL with a capacity of 200 kilovolts (kV) or more and greater than 1,500 feet in length."

Xcel Energy and Great River Energy, on behalf of CapX 2020, applied for one CON for three of the Group 1 CapX 2020 transmission line projects, including the Hampton – Rochester – La Crosse project, on August 16, 2007.

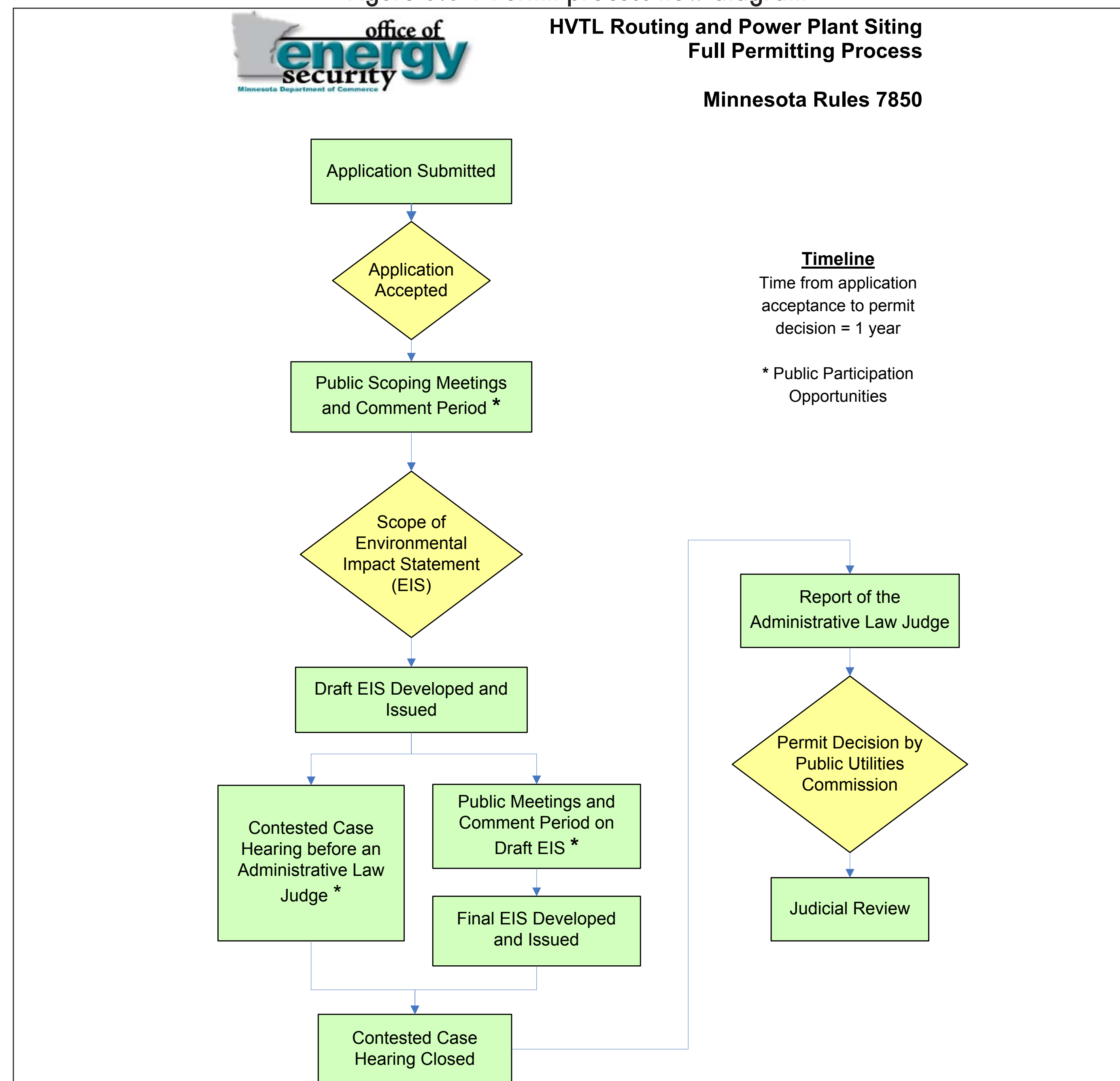
After accepting the CON application as complete, the Commission referred the matter to the Office of Administrative Hearings for a hearing before an administrative law judge (ALJ). The ALJ convened 19 public hearings along the anticipated corridors for all three proposed 345 kV transmission lines in the cities of Moorhead, Fergus Falls, Alexandria, Melrose, Clearwater, Marshall, Redwood Falls, Arlington, New Prague, Lakeville, Cannon Falls, Winona, and Rochester.

Evidentiary hearings were held from July 14, 2008, to August 1, 2008; from August 11, 2008, to August 14, 2008; and from September 11, 2008, to September 18, 2008, in St. Paul, Minnesota. The ALJ issued Findings of Fact, Conclusions, and a Recommendation (ALJ's report) to the Commission on February 27, 2009. On May 22, 2009, the Commission issued an order granting a CON with conditions for the Group 1 CapX 2020 transmission line projects.

3.2 Route Permit Process

The Power Plant Siting Act (PPSA) provides that no person may construct a HVTL without a route permit from the Commission (Minnesota Statutes Section 216E.03, subd. 2). Under the PPSA, a HVTL includes a transmission line of 100 kV or more and greater than 1,500 feet in length, with its associated facilities (Minnesota Statutes Section 216E.01, subd. 4). The applicant's proposed 161 kV and 345 kV transmission lines by definition are HVTLs and, therefore, require a route permit prior to construction. See Figure 3.3-1 for detailed route permit process.

Figure 3.3-1 Permit process flow diagram



The applicant submitted a route permit application (RPA) for the Hampton – Rochester – La Crosse project to the Commission on January 15, 2010 (Docket No. E002/TL-09-1448). On March 9, 2010, the Commission issued an order accepting the RPA as complete and authorizing the OES to develop and facilitate two advisory task forces. The Commission also referred the RPA to the Office of Administrative Hearings for a contested case hearing.

Scoping the Draft Environmental Impact Statement

RPAs for HVTLs are subject to environmental review in accordance with Minnesota Rules 7850.5200 to 7850.5340 (full permitting process). OES Energy Facility Permitting (EFP) staff are responsible for conducting this environmental review. For this project, the environmental review document is an EIS.

The first step in the review process following acceptance of the RPA is scoping. The scoping process has two primary purposes: (1) to ensure that the public has a chance to participate in determining what routes and issues should be studied in the EIS, and (2) to help focus the EIS on the most important issues surrounding the route permit decision (see Appendix K).

OES EFP staff solicited comments on the scope of the EIS through six public meetings, May 4 through May 6, 2010, at three different locations along the proposed routes: Plainview, Pine Island, and Cannon Falls. A court reporter was present at each of the public meetings to record questions asked and comments made by the public as well as responses from the OES EFP staff and the applicant. OES accepted written comments from the public from April 19 through May 20, 2010. In addition, OES EFP staff received input on the scope of the EIS through two geographically-based advisory task forces (ATFs). These were the Hampton to Northern Hills ATF and the North Rochester to Mississippi River ATF. The task forces each met three times between April and June 2010.

The scoping decision for the EIS was issued by the OES on August 6, 2010, and is presented in Appendix K. In accordance with the scoping decision, the following issues are not addressed in this EIS:

- Any route or substation alternatives not specifically addressed in the EIS Scoping Decision Document, PUC Docket No. ET2/TL-09-1448.
- Questions of need, including size, type, and timing; questions of alternative system configurations; or questions of voltage.
- The no-build option regarding the HVTL.
- The impacts of specific energy sources, such as carbon outputs from coal-generated facilities.
- Policy issues surrounding whether utilities or local-government should be liable for the cost to relocate utility poles when roadways are widened.
- The manner in which land owners are paid for transmission rights of way (ROW) easements, as that is outside the jurisdiction of the Commission.

Draft EIS Comments

As shown in Figure 3.3-1, the route permitting process is currently at the draft EIS stage. At this point, the OES has issued the draft EIS and is asking the public to review the draft and submit comments so the EIS includes the best information possible for this route decision. The OES will hold public information meetings during the draft EIS comment period to provide information to the public about the draft EIS, and to solicit comments on the draft EIS. All timely, substantive comments received will be included in a final EIS along with responses to these comments, including revisions to the draft EIS.

The EIS does not advocate or state a preference for a specific route or route segment. Rather, the EIS characterizes, analyses, and compares routes and route segments such that citizens, governmental units, agencies, and the Commission can work from a common set of facts.

Public Hearing

After the draft EIS public meetings, public hearings will be held along the proposed routes. The hearings will be conducted by an administrative law judge (ALJ). At the hearing, persons can provide comments regarding the proposed project, routes, structures, and permit conditions. Citizens can advocate for the route(s) they feel are most appropriate for the project. The ALJ will ensure that the record created at the hearing is preserved and transmitted to the Commission. The ALJ will prepare a report to the Commission that will include proposed findings of fact, conclusions of law, and a recommendation for a route.

Final EIS

After the draft EIS comment period, OES EFP staff will prepare a final EIS. The final EIS will include all comments on the draft EIS and staff responses to these comments, including revisions to the draft EIS. The final EIS will be entered into the public hearing record and will be considered by the ALJ in their report and recommendation.

Route Permit Decision

After the final EIS is published and the ALJ issues findings of fact, conclusions of law, and recommendation, the Commission will schedule a meeting at which it will consider a route permit decision. The date for the Commission meeting will not be scheduled until the final EIS and ALJ report are issued.

The Commission must first find that the final EIS has adequately addressed the issues presented in the scoping decision. Then the Commission will make a decision on which route to permit and what conditions to include in the route permit. The Commission is charged with choosing a route that conserves resources, minimizes environmental impacts, minimizes human settlement and other land use conflicts, and ensures the state's electric energy security through efficient, cost-effective power supply and electric transmission infrastructure (Minn Stat 216E.03). Additionally, Minnesota Rules list a number of factors which the Commission must consider in making a routing decision (Minnesota Rules 7850.4100):

- Effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services.
- Effects on public health and safety.
- Effects on land-based economics, including, but not limited to, agriculture, forestry, tourism, and mining.
- Effects on archaeological and historic resources.
- Effects on the natural environment, including effects on air and water quality resources and flora and fauna.
- Effects on rare and unique natural resources.
- Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity.
- Use or paralleling of existing ROWs, survey lines, natural division lines, and agricultural field boundaries.
- Use of existing large electric power generating plant sites.
- Use of existing transportation, pipeline, and electrical transmission systems or ROWs.
- Electrical system reliability.
- Costs of constructing, operating, and maintaining the facility which are dependent on design and route.
- Adverse human and natural environmental effects which cannot be avoided.
- Irreversible and irretrievable commitments of resources.

This section of the draft environmental impact statement (EIS) describes what the proposed transmission line poles would look like and how wide the right-of-way (ROW) would have to be for the selected structure type. The section finishes with a discussion on the potential for undergrounding the 345 kilovolt (kV) transmission line and the applicability with regard to this project.

4.1 High-Voltage Transmission Line Basics

High-voltage transmission line (HVTL) circuits generally consist of three phases, each at the end of a separate insulator, and physically supported by structures. A phase consists of one or more conductors (single, double, or bundled). A typical conductor is a cable consisting of aluminum wires stranded around a core of steel wires. There may also be shield wires strung above the phases to prevent damage from potential lightning strikes. The shield wire could also include a fiber optic cable that allows for substation protection equipment to communicate with other terminals on the line.

Explain "phases" of electrical currents

Electricity is generated when a magnet rotates inside the coils in a generator. Because one pole of a magnet will move past one coil and then the subsequent coils, there is a difference in timing of the alternating current induced in each coil. This is called the different "phases" of current. Most high-voltage transmission lines carry three-phase alternating-current power because that is how the electricity is generated at power plants. The transmission line transfers each of the three phases of alternating current on separate wires so that power can be transferred constantly over each cycle. This also makes it possible for electric motors to use electric energy more efficiently.

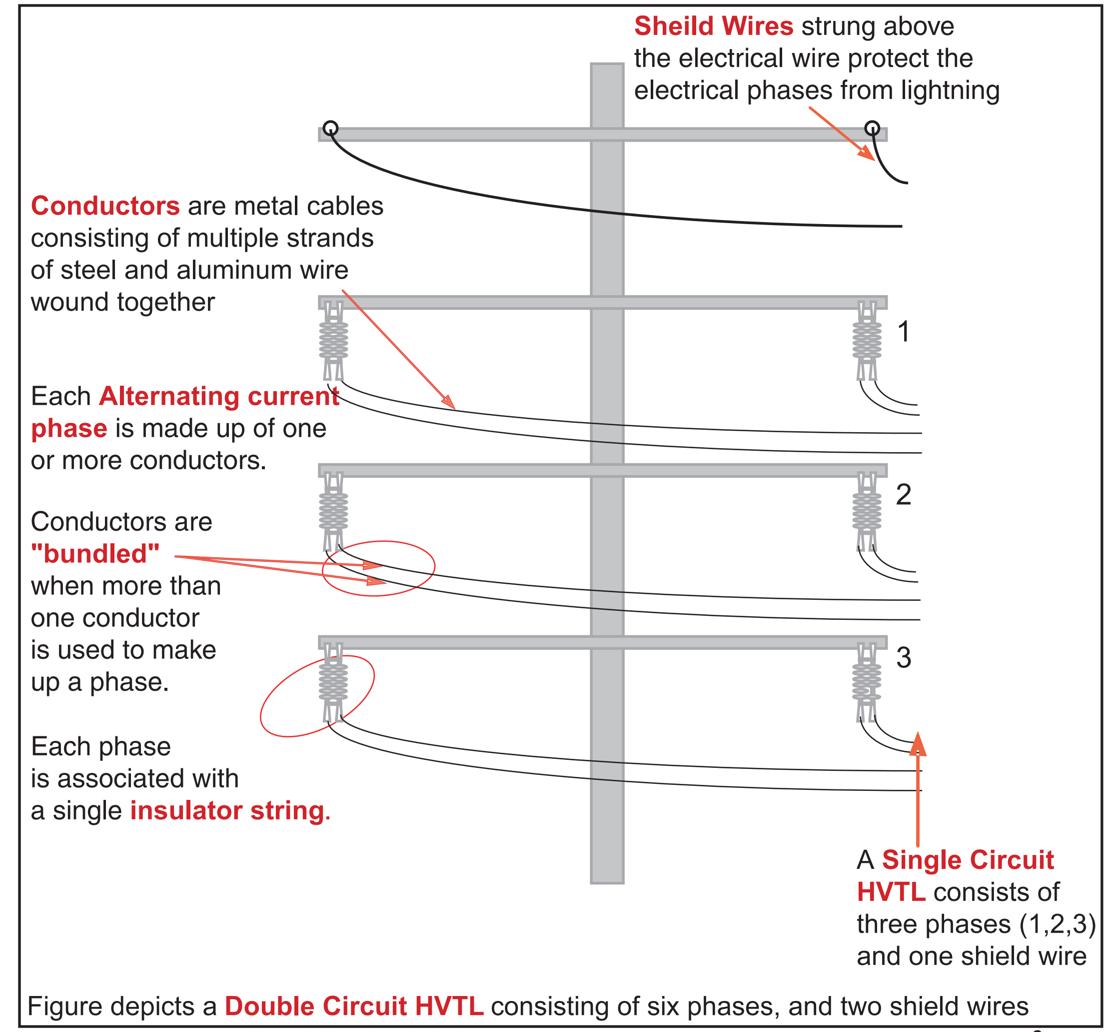
Figure 4.1-1 shows the major components of a typical transmission line. The diagram shows a typical double-circuit HVTL structure. There are three conductors per circuit because most power plants generate electricity such that each of the three conductors operates at a different phase. Second, as shown in the figure, each of the wires hangs from the end of a separate insulator string.

Finally, transmission lines are usually either single-circuit, (carrying one three-phase conductor set), or double-circuit (carrying two three-phase conductor sets, totaling six conductors). The various structure configurations and conductors proposed for this project are shown and described in the following sections.

4.2 Conductors

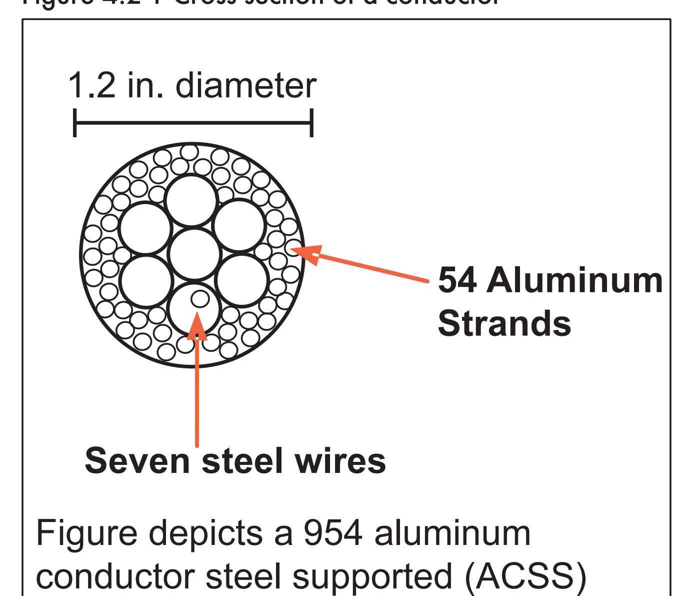
For the proposed 345 kV transmission lines, each phase would consist of bundled conductors composed of two 954 aluminum conductor steel supported (ACSS) cables or conductors of comparable capacity. Each phase of the 161 kV transmission line would consist of a single conductor using 795 ACSS cable or a conductor of comparable capacity. An ACSS consists of seven steel wires surrounded by 54 aluminum strands. Each conductor is approximately 1.2 inches in diameter (Figure 4.2-1). As indicated by the applicant, the same conductor and bundled configuration would be used for all the 345 kV and 161 kV transmission line sections.

Figure 4.1-1 Major components of typical transmission line



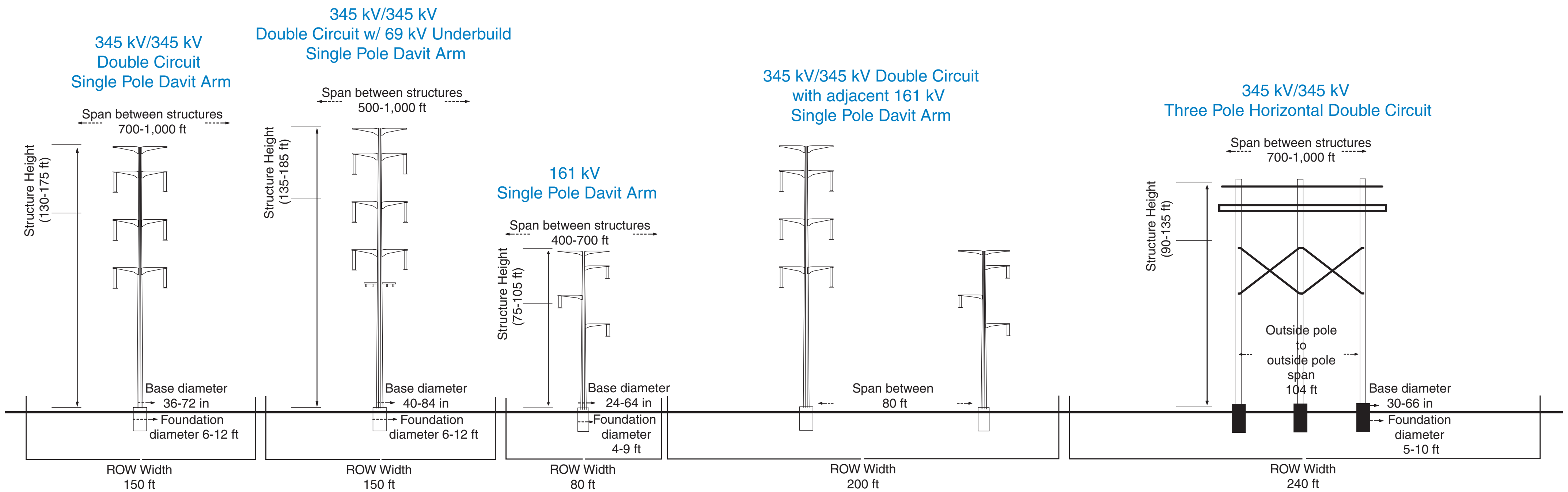
Source: Barr figure, 2009

Figure 4.2-1 Cross section of a conductor



Source: Barr figure, 2009

Figure 4.3-1 Structure designs and foundations being proposed for the project



Source: Barr figure, 2011

4.3 Transmission Line Structures

There are many different types of structures/configurations used for transmission lines, including single steel-pole structures and H-frame structures. The exact width of ROW required for the transmission line, in turn, depends on structure design, span length, and the electrical safety requirements associated with the transmission line's voltage. Figure 4.3-1 shows the proposed structure types for the project.

For this project, the applicant is proposing to use self-weathering single-pole double-circuit structures to carry the 345 kV transmission line for the majority of the project. Self-weathering single pole single-circuit structures would be used for the 161 kV transmission line.

The single-pole steel structures would range from 130 to 175 feet in height for the 345 kV structures (Figure 4.3-1), and 70 to 105 feet for the 161 kV structures (Figure 4.3-1). Spans would typically be 700 to 1,000 feet between structures on the 345 kV transmission line, and 400 to 700 feet on the 161 kV transmission line. For the 345 kV transmission line, only one circuit would be strung and the other side of the pole would be available for adding a second circuit in the future, if and when conditions warrant. Adding a second circuit would require approval from the Public Utilities Commission (commission). Single-pole steel structures are typically placed on large pier foundations of cast-in-place, reinforced concrete.

Multiple-circuit structures are proposed in two areas of the Segment 1-B route alternatives:

- on the Hampton–North Rochester 345 kV section along US-52 between Cannon Falls and Zumbrota, and
- on the North Rochester–Mississippi River 345 kV section near Plainview.

These proposed triple-circuit structures would hold one 345 kV circuit, provide a location for a future 345 kV circuit, and carry an existing 69 kV circuit under the 345 kV transmission lines (a configuration know as "underbuilding"). These structures would range in height from 135 to 185 feet and have spans of approximately 500 to 1,000 feet. The triple-circuit structures may require an additional pole mid-span to support the 69 kV circuit.

Several comments received during the EIS scoping process suggested other areas of the applicant's preferred and alternate route segments where double or triple-circuit structures should be considered and evaluated. These route alternatives are described in Sections 8.2 and 8.3; in those sections these route alternatives are referred to as the "C Routes." Figure 4.3-1 illustrates a representative double-circuit 345/345 kV structure with 69 kV underbuild.

One or two shield wires would be used to protect the conductors from lightning strikes. One of these shield wires would likely incorporate a fiber optic cable to facilitate control communications between substations and between substations and utility control centers. Fiber optics would be used only for utility purposes.

Why use single-pole steel structures?

Steel single-pole structures, also known as monopoles, require only one pole along the ROW, with a relatively narrow footprint compared to steel lattice or other types of structures. This reduces the impact on farming operations and other impacts compared to the two poles required for H-frames, or the wide bases of steel lattice structures. Steel monopoles are more durable and longer-lasting, because they are self-weathering, which means that the steel oxidizes or rusts to form a dark reddish brown surface coating which protects the structure from further weathering.

In areas of poor soil strength and for angle and dead-end structures, a rock-filled galvanized steel culvert or drilled pier concrete foundation may also be inserted for additional stability. Support cables (guying) may also be used for angle structures.

Table 4.3-1 summarizes the proposed structure types for the project. In addition to the structures described in the table, the applicant may elect to use H-frame structures in certain areas. H-frame structures consist of two poles connected with cross-braces and a beam that supports the conductors. H-frame structures may be used in certain areas where longer spans are desired, such as in environmentally sensitive areas, areas of difficult topography and elevation changes, or where poor soil conditions exist. These structures, when used, typically minimize the overall total number of structures required in an area as well (e.g., minimizing the number of structures in a river's riparian zone). H-frames also allow all of the conductors to be strung in a single horizontal plane, therefore minimizing the vertical barrier that avian wildlife would cross.

4.4 Right-of-Way Requirements

The applicant has indicated that a 150-foot wide ROW would be required for the proposed 345 kV transmission lines and an 80-foot-wide ROW would be required for the proposed 161 transmission lines. As noted above, H-frame or other specialty structures may be used for long spans or in environmentally sensitive areas, such as large wetland complexes. In that case, an up to 180-foot wide ROW may be needed. H-frames may also be used for crossing the Upper Mississippi River National Wildlife and Fish Refuge to minimize the potential for avian impacts near the point where the 345 kV transmission line would cross the Mississippi River. In that case, an up to 280-foot wide ROW may be needed; this would require an expansion of the existing U.S. Fish and Wildlife Service (USFWS) permitted 180-foot ROW.

Figure 4.3-1 shows the designs and foundations for the structures the applicant is proposing for the 345 kV and 161 kV portions of this project, respectively, along with the typical ROW required for each.

When a transmission line is placed across private land, a ROW agreement, typically an easement, is required (see Appendix C). When a transmission line is placed entirely across private land, an easement for the entire 150-foot ROW (for 345 kV transmission lines) or 80-foot ROW (for 161 kV transmission lines) would need to be acquired from the landowner(s). The applicant has indicated a preference for locating poles as close to property division lines as reasonably possible to reduce the amount of ROW on a particular property.

When a transmission line parallels roads, railroads, or other transmission lines, a landowner may be able to have a narrower easement. When paralleling existing roadways, for example, the general practice is to place the poles on the adjacent private property, a few feet inside the existing road ROW. So, although the pole is still located on private property, the transmission line can share some of the public ROW, thereby reducing the size of the easement required from the private landowner. For example, if the normally required ROW width is 150 feet, and the pole is placed five feet off of an existing road ROW, only an 80-foot easement would be required from the landowner. The roadway and transmission line would share the other 70-foot-wide section of ROW.

Siting transmission lines along existing ROWs can minimize the proliferation of new utility corridors and private landowner impacts. However, in order to share ROW, the applicant would have to acquire necessary approvals from the ROW owner (e.g. railroad) or the agency overseeing use of a particular ROW (e.g., Minnesota Department of Transportation (DOT)).

The DOT's Utility Accommodation Policy outlines the policies and procedures governing use and sharing of state trunk highway ROWs by utilities. The policy was developed in accordance with the requirements of state and federal law (Code of Federal Regulations, Title 23, Part 645, Subpart B). It is designed to ensure that the placement of utilities does not interfere with the flow of traffic and the safe operation of vehicles.

DOT has a responsibility to preserve the public investment in the transportation system and to ensure that non-highway uses of the ROW do not interfere with the ability of the state to make long-term highway improvements, such as adding lanes, interchanges, or bridges, or to safely operate and maintain the existing system. In addition, state law requires DOT to reimburse the utility if a utility must be relocated from permit applicationROW along an interstate highway as a result of future expansion or new interchanges (Minnesota Statutes 161.46 Reimbursement of Utility).

Requirements of the Utility Accommodation Policy vary based on whether the utility is crossing the highway or being installed parallel to it and based on the type of highway. For controlled access highways or freeways, "the installation of new utility facilities shall not be allowed longitudinally within the ROW of any freeway, except in special cases under strictly controlled conditions." (DOT 2005). This means that the transmission structure–the poles and davit arms–must be completely outside of the freeway ROW. For this project, this would mean placing a pole approximately 20 to 25 feet outside the ROW.

The Utility Accommodation Policy does provide for exceptions where special circumstances exist. If the highway is part of the National Highway System, the exception must be approved by the Federal Highway Administration and would be considered a federal action, meaning that the requirements of the National Environmental Policy Act (NEPA) must be met.

The percentage and type of shared (or "accommodated") ROW for each route alternative is discussed in Section 8 of this draft EIS.

4.5 Underground Options

Undergrounding of transmission lines can be a feasible option, especially for lower voltage transmission lines. However, at higher voltages, undergrounding becomes progressively more complex. It is common today to see lower-voltage distribution lines that connect to homes and businesses buried directly in the ground using less invasive construction methods. In these cases, undergrounding offers aesthetic and environmental benefits while posing relatively few construction, maintenance, and operational challenges.

Table 4.3-1 Proposed structure design summary

Line Type (Design Configuration)	Initial Configuration	Structure Type	Structure Material	ROW Width (feet)[c]	Structure Height (feet)[c]	Structure Width (outside pole-to-outside pole) (feet)	Structure Base Diameter (inches)[c]	Foundation Diameter (feet)[c]	Span Between Structures (feet)[c]
345 kV/345 kV Double-Circuit	345 kV circuit operational	Single Pole Davit Arm Vertical	Steel	150	130–175	n/a	36–48 (tangent structures) 48–72 (angle structures)	6–12	700–1,000
	345 kV circuit operational/ 161 kV circuit operational	Single Pole Davit Arm Vertical	Steel	150	130–175	n/a	36–48 (tangent structures) 48–72 (angle structures)	6–12	700–1,000
	345 kV circuit operational/ 161 kV circuit operational	Three pole Horizontal Double Circuit	Steel	240	90—135	104	30-42 (tangent structures) 42—66 (angle structures)	5-10	700—1,000
345 kV Single Circuit	345 kV	Two pole Horizontal H-frame	Steel	170	90—135	27	30-42 (tangent structures) 42—66 (angle structures)	5-10	700—1,000
345 kV/345 kV Double-Circuit w/69 kV Underbuild	345 kV circuit and 69 kV underbuild circuit operational	Single Pole Davit Arm Vertical	Steel	150	135-185	n/a	40–52 (tangent structures) 48–84 (angle structures	6-12	500-1,000
161 kV Single Circuit	161 kV circuit operational	Single Pole Davit Arm	Steel	80	70-105	n/a	24–36 (tangent structures) 32–64 (angle structures)	4-9	400-700

[c] Typical range for specified line type.

A number of factors are involved in the consideration of undergrounding a HVTL, including: construction, electromagnetic fields (EMF), cost, and maintenance.

Construction

Installation generally includes direct burial in backfilled trenches and concrete trenches with covers or concrete ductbanks. Constructing the trench for the underground transmission line would result in greater temporary construction impacts than the proposed overhead line. Underground transmission construction as compared to overhead lines increases noise, dust, and traffic disruption. Considerable clearing and grading would be expected in suburban and rural settings, and dust and noise from construction would last three to six times the duration of an overhead line.

Concrete manholes or large splice vaults are needed at recurring intervals. During repairs, a whole segment between these vaults may need to be excavated again.

A typical progression rate for underground construction would be two to three days for each 200-foot section of trench. Approximately 500 to 700 feet of trench is open at one time. Steel plates are typically placed over open sections of trench when crews are not at that location. Access to homes (driveways, front yards, sidewalks, and street parking) may be limited for several days to weeks during construction and local traffic would likely be rerouted to other streets, or redirected by a traffic monitor. According to the applicant, underground conductors of the size appropriate for this project are generally limited to approximately 1,000-foot-long segments, due to the state of the technology, materials, and shipping weight and size restrictions.

Electromagnetic Fields

The calculated EMF profiles for underground transmission lines generally show a higher EMF level directly above the line, but the fields decrease faster with distance compared to levels under overhead lines.

Electric fields created by transmission lines can be blocked by different objects such as trees, structures, cars, and soil; therefore, electric fields may be significantly diminished by undergrounding transmission lines. Magnetic fields, however, are difficult to block and would continue to pass through the ground. Regardless of overhead or underground construction, magnetic and electric field intensity decrease with distance.

Cost

An underground transmission line is expected to cost up to 10 times more per mile compared to construction of an overhead transmission line, due to time, materials, process, and the use of specialized labor. An underground transmission line must also be routed to avoid other underground installations such as water, gas, and sewer lines. Unstable slopes, hazardous material sites, wetlands, and bedrock must be avoided. Going under a road, highway, or river requires expensive construction techniques such as directional boring. All of these aspects of underground transmission line construction lead to a higher cost than overhead transmission line construction. For example, the applicant engaged an engineering firm to determine the feasibility of underground installation for the double circuit 345 kV line at the river crossing near Kellogg, Minnesota. The length of the underground alternative studied is 1.3 miles and has an estimated cost of $90 million. This is approximately $70 million per mile for underground double circuit 345 kV compared to approximately $2 million per mile for overhead (see Appendices E-F of the Route Permit Application (RPA) or Appendix D of the draft EIS).

Maintenance

Although failure of underground transmission lines is rare, a major disadvantage of building underground transmission lines is the difficulty of finding and repairing failures. It can be difficult to determine the location of a failure on an underground line. Overhead failures can usually be found through visual inspection. And while overhead failures can usually be repaired in hours or days, repairs on an underground system can be more complex. Underground cable failures must first be located, then excavated and repaired. These excavated repairs can take weeks or months, depending on the extent of damage and the availability of replacement materials. Thus the cost for maintenance on an underground transmission line compared to an above ground transmission line can be significantly higher.

Undergrounding of High-Voltage Transmission Lines Requires Greater Infrastructure

Underground lines require additional equipment to compensate for voltage rise along the distance of the transmission line. The additional equipment translates to a higher overall cost, limits the length of the underground installation, and increases the likelihood of failure due to additional components. Depending on the type of cable system used, cooling equipment may be required at underground transmission line substations. The cooling equipment increases noises above ground. Overhead lines are air cooled and widely spaced for safety. In general, there are three major types of underground transmission facilities: high- and low-pressure oil-filled systems, solid dialectic systems, and compressed gas insulated systems. These systems may require the installation of additional cables to meet the equivalent capacity requirements of the overhead line. Because of these challenges, placing high-voltage transmission lines, like the lines proposed for this project, underground is a practice generally used only when there is no viable overhead corridor and for very limited distances.

4.5.1 Undergrounding at River Crossings

Two different construction methods are available for undergrounding a transmission line at a river crossing: submarine cable and directional boring.

- Submarine cable: The transmission line can be laid along the bottom of the river using a hydro-plowing procedure that partially imbeds the line on the bottom of the river. Submarine cables can be susceptible to damage from floods, river debris, and boat anchors. Submarine cables also create a potential safety hazard for boaters.
- Directional boring: A casing could be directionally bored at each river crossing and the conductor could be installed in the casing. Unknown bedrock or boulders may be encountered during the drilling phase, which may result in damage to drilling equipment and sometimes requires new boring paths to be started.

Whether installed using submarine cable or directional drilling, underground HVTLs present some obstacles. First, either installation method would require a transition structure at each end, where the transmission line transitions from overhead to underground and from underground to overhead. Because of the high voltage, these transition structures would likely be low to the ground and enclosed by a fence, typically requiring approximately one acre of land. Accessing construction and excavation sites and the associated belowground vaults and transition structures may be complicated by the challenging topography of the Mississippi River area.

Second, the submarine cable underground construction method would disturb the riverbed and aquatic vegetation and could impact water quality and aquatic organisms. The directional boring underground construction method would require significant excavation and relatively large work areas at each end of the bore. In addition, depending on the location needed for construction, vehicles and equipment and materials for directional drilling may impact the surrounding environment more than the equipment required for installation of overhead lines. Options for an underground crossing of the Mississippi River are discussed in detail in Section 6.3.2.

This section of the draft environmental impact statement (EIS) summarizes the procedures that the applicant would use to acquire right-of-way (ROW), construct and maintain the transmission line, and compensate landowners for any damage done during construction or maintenance.

Before construction can begin, the applicant must obtain all federal, state, and local approvals. The applicant must also acquire private easement rights, complete soil testing, and finish detailed engineering and design, including determining exact pole placement locations.

5.1 Applicable State Regulation

After the route permit is issued, but before construction begins, the applicant would send their preliminary designs and other information to the Minnesota Public Utilities Commission (Commission) and the Office of Energy Security (OES) for review to ensure that permit conditions are being followed. In addition, the Commission's route permit would incorporate an Agriculture Impact Mitigation Plan (AIMP), which describes the applicant's plan for soil damage mitigation. This plan is approved by the Minnesota Department of Agriculture (MDA).

Construction impacts are also addressed in a variety of construction-related permits, such as the Minnesota Pollution Control Agency's (PCA) construction storm water discharge permit (see Section 9 for a complete list of necessary permits).

Finally, as described below, the applicant has its own standard construction and best management practices (BMPs) that have been developed from past projects to address ROW clearing, staging, erecting transmission line structures, and stringing transmission lines.

5.2 Utility Right-of-Way Acquisition Process

Should the Commission select a route alternative and issue a route permit, the applicant's ROW acquisition process would begin early in the detailed design phase. The Commission is not involved in the ROW acquisition process.

Typically, utilities acquire an easement (not fee title) from landowners to accommodate transmission lines and associated facilities. However, utilities would purchase the land necessary for new or expanded substations. For this project the applicant would have to acquire an 80- to 180-foot-wide ROW easement to accommodate the proposed 345 kilovolt (kV) and 161 kV transmission lines (see Section 4 for details on ROW requirements).

Section 3.4 of the applicant's route permit application (RPA) provides details regarding the ROW acquisition process (in addition see Appendix C). Their acquisition process can be broken down into the following eight steps:

- **Title examination**: A public records search is completed and a title report is developed to determine the owner(s), and legal description.
- **Initial contact**: A utility ROW agent contacts each property owner to discuss pole placement and to identify other construction concerns.
- **Survey work and site assessment**: The agent may request permission for preliminary survey work and soil borings to determine the detailed engineering of the transmission line. The proposed location of each structure or pole on the ground would be staked and easement area required for safe operation of the line would be marked.
- **Negotiation**: The agent then negotiates with the owner to determine compensation for the rights to build, operate, and maintain the transmission facilities within the easement area.
- **Document** preparation and purchase: In most cases, utilities are able to work with the landowners to address their concerns and an agreement is reached for an easement purchase. The agent then prepares all of the documents required to complete each transaction.
- **Pre-construction owner contact**: Prior to construction, the utility's ROW agent would contact the owner of each parcel to discuss the construction schedule and requirements. Special consideration may be needed for fences, crops, or livestock. In each case the same agent coordinates these processes and compensation for any damages with the landowner.
- **Eminent domain**: If, however, a negotiated settlement cannot be reached, the landowner may choose to have an independent third party determine the value of the land acquisition. Such valuation is made through the eminent domain process pursuant to Minnesota Statutes Chapter 117.

5.3 Transmission Line Construction

The precise timing of construction would take into account factors including permit conditions, system loading issues, and available workforce. Details regarding the applicant's construction procedures are provided in Section 3.4 of the RPA.

5.3.1 Construction Impact Areas

Major construction-related impacts during transmission line construction (in the general sequence they occur) are due to the following five activities: ROW access, staging and lay-down areas, grading areas, pole installation, and conductor installation.

Right-of-Way Access

Typically, existing roads or trails that run parallel or perpendicular to the transmission line are used to access the actual transmission line ROW. Where use of private field roads or trails is necessary, permission from the property owner is obtained prior to access. In some cases, new access roads may have to be constructed when no current access is available or existing access is inadequate for the heavy equipment used in construction.

Staging and Lay-Down Areas

The materials are stored on-site at staging areas until they are needed for construction. Larger temporary lay down areas may also be needed in some areas depending on access, security, and efficiency and safety for warehousing supplies.

Temporary lay-down areas outside of the transmission line ROW would not be included in a route permit. Permission would be obtained from land owners through rental agreements.

Areas Requiring Grading

Transmission line structures are generally installed at existing grades. However, along areas with more than 10 percent slope, working areas would have to be graded level or fill would be brought in to create working pads. If the landowner permits, it is preferred to leave the leveled areas and working pads remaining in place for future maintenance activities. Otherwise, the site is graded back to its original condition as much as possible and all imported fill is removed.

Power Pole Installation

When sites are prepared for installation, poles are generally moved from the staging areas and delivered to the staked location and placed within the ROW. Insulators and other hardware are attached while the pole is on the ground. The pole is then lifted, placed, and secured using a crane.

When needed, how big are the concrete foundations?

Holes 5 to 7 feet in diameter and 12 or more feet deep (depending on soil conditions) are drilled. After concrete is set, the pole is bolted to it. No guy wires are required in this setup.

In nearly all cases, the poles would be installed using concrete foundations or direct embedding. Where single poles structures are under lower stress (tangent and light angle structures) poles are placed on concrete foundations or directly embedded. Where single pole structures are under higher stress (medium angle, heavy angle or dead-end structures) drilled pier concrete foundations are required. Where H-frame structures are used, the applicant may use poured concrete foundations.

What is direct embedding?

Holes approximately six feet in diameter and 10 to 15 feet deep are augured or excavated. The hole is partially filled with crushed rock, the pole is set on top of the rock base and the hole is backfilled with crushed rock and/or soil. In poor soil conditions, a galvanized steel culvert may be installed vertically with the structure set inside. No guy wires are required.

Conductor Installation

After pole placement, conductors are installed in stringing setup areas located approximately every two miles along a project route, either within the ROW or on temporary construction easements. Brief access to each structure is needed to secure the conductor wire to the insulator hardware and the shield wire. Where the transmission line crosses streets, roads, highways, or other obstructions, a temporary guard or clearance poles may be installed to protect conductors and to ensure safety during installation.

Post Installation Back-Filling

Excavated material, native soil, or crushed rock is used to back-fill holes after pole placement. If landowner permission is obtained, it is preferred to spread excess soil from foundation holes on the structure site. Otherwise, depending on landowner preference, the material would be given to the landowner or would be completely removed from the site.

5.3.2 Mitigation

Generally, whether following their own procedures or specific permit requirements, the applicant would minimize impacts from construction activities by:

- Placing construction mats in wet or soft soil locations and narrow ditches to minimize disturbances,
- Spanning all streams and rivers, and spanning all wetlands to the extent possible,
- Not driving construction equipment across waterways except under special circumstances and only after discussion with the appropriate resource agency,
- Crossing waterways using boats, or by driving equipment in water crossing areas only when frozen in winter (to pull in new conductors and shield wires for example), and
- Fueling and lubricating far from waterways to ensure that fuel and lubricants do not enter waterways.

5.4 Substation Construction

The project would require construction of one new substation, the North Rochester Substation. The Hampton Substation has been permitted separately in the Brookings to Hampton CapX 2020 project. The proposed new La Crosse area substation would be permitted in a separate proceeding before the Public Service Commission of Wisconsin (PSCW).

The North Rochester Substation, which would accommodate the applicant's preferred or alternate routes, would be located in the area between Zumbrota and Pine Island, Minnesota. The actual location of the new substation will be determined through the route permitting process; however, the proposed siting area lies within a portion of southern Goodhue County west of U.S. Highway 52, south of State Highway 60 and north of 500th Street. The North Rochester Substation area is shown on Map 5.4-1. Approximately 8 acres of fenced and graded land would be required for substation construction; however, the applicant is seeking approximately 40 acres in order to provide adequate buffer and to allow for transmission lines to connect to the substation. The new North Rochester Substation would include six 345 kV circuit breakers, a 345 kV/161 kV transformer, three 161 kV circuit breakers, a control house and associated line termination structures, switches, buswork, controls, and associated equipment. Clearing and grading of the site would be required for the new North Rochester Substation.

5.4.1 Expansion of Existing Substations

The existing Northern Hills Substation would require an approximately 0.5-acre expansion of the graded and fenced area in order to accommodate the new 161 kV transmission line and related equipment. No additional property would be required to construct the expansion. Improvements would include an expansion of the existing graded area by approximately 30 feet and the addition of 161 kV equipment, including one circuit breaker and associated switches and controls. Construction would include the switches, foundations, steel structures, and control panels.

5.5 Cleanup and Restoration

In general, as construction on each parcel is completed, disturbed areas are restored to their original condition to the maximum extent possible. Afterwards, the utility ROW agent would contact each property owner to see if any damage has occurred as a result of the project. This issue is also covered in the AIMP (see Appendix E) approved by the MDA.

In general, if damage has occurred to crops, fences, or the property, the applicant would reimburse the landowner for the damages sustained. In some cases, an outside contractor may be hired to restore the damaged property to as near as possible to its original condition. Any vegetation disturbed or removed during the construction of transmission lines typically would naturally reestablish to pre-disturbance conditions. However, areas with significant soil compaction and disturbance from construction activities would require assistance in reestablishing the vegetation stratum and controlling soil erosion.

Commonly used methods to control soil erosion during construction and assist in reestablishing vegetation include, but are not limited to, erosion control blankets with embedded seeds, silt fences, and hay bales.

What is the Agricultural Impact Mitigation Plan?

Based on similar plans developed for pipeline construction permits, the Agricultural Impact Mitigation Plan (which is approved by the Minnesota Department of Agriculture) outlines the requirements the utility must follow when constructing, restoring, and maintaining the project on agricultural property.

5.6 Maintenance

Transmission infrastructure has very few mechanical elements and is built to withstand normal weather extremes. With the exception of severe weather, such as tornadoes and heavy ice storms, high-voltage transmission lines (HVTLs) rarely fail.

The primary operating and maintenance cost for transmission facilities is the cost of inspections, which are usually done monthly by air. Scheduled maintenance outages are infrequent. As a result, the average annual availability of transmission infrastructure is very high, in excess of 99 percent.

Substations require a certain amount of maintenance to keep them functioning in accordance with accepted operating parameters and National Electrical Safety Code (NESC) and North American Electric Reliability Code (NERC) requirements. Transformers, circuit breakers, batteries, protective relays, and other equipment need to be serviced periodically in accordance with the manufacturer's recommendation. The site itself must be kept free of vegetation and drainage must be maintained.

How much maintenance would be necessary?

Based on similar plans developed for pipelines, transmission lines and substations are designed to operate for decades with minimal maintenance, particularly in the first few years of operation.

6.1 Crossing the Mississippi River

An important factor in determining the route for the 345 kilovolt (kV) transmission line was the selection of the location where the transmission line would cross the Mississippi River. The river crossing establishes the eastern terminus of the transmission line in Minnesota, and therefore has a strong influence on the transmission line routes considered in Minnesota and Wisconsin. The selection of the crossing location requires analysis of feasible alternatives, since the Mississippi River is recognized as a valuable resource with designated habitat areas and many recreational opportunities.

A number of factors limit the number of feasible crossing location alternatives. These include the width of the Mississippi River, the topography of southeastern Minnesota's bluffands, the presence of natural areas including State and Federal properties, the presence of existing infrastructure crossing the river, and existing settlements.

On the Minnesota side, the approach to potential crossings would have to traverse blufflands that border the Mississippi River. On the Wisconsin side, the geographic area is similarly characterized by a rugged, hilly region dissected by rivers and streams, rocky outcroppings, and numerous small caves abutting the Mississippi River.

There are two designated wildlife refuges along the Mississippi River in the project area managed by the U.S. Fish and Wildlife Service (USFWS). These are the Upper Mississippi River National Fish and Wildlife Refuge (Refuge) and the Trempealeau National Wildlife Refuge. Any crossing of either refuge would require a Special Use Permit from USFWS.

The applicant identified and analyzed four potential crossing locations in the Route Permit Application (RPA). These are shown in Map 6.1-1, River Crossing Alternatives Considered, and are identified as:

- Alma, Wisconsin. The RPA identifies Alma, Wisconsin as an alternative for a crossing location. However, the draft EIS evaluates only the Minnesota portion of the project. Therefore, the Alma crossing is referred to as the Kellogg crossing in the draft EIS, after the Minnesota town nearest the crossing location.;
- Winona, Minnesota, referred to as the Winona crossing;
- La Crescent, Minnesota, referred to as the La Crescent crossing;
- Trempealeau, Wisconsin, referred to as the Trempealeau crossing.

Through a process of evaluation, consultation, and stakeholder input, the applicant determined that the crossing at Alma, Wisconsin (Kellogg crossing), just east of Kellogg, Minnesota, would best minimize potential human and environmental impacts.

6.1.1 Factors Supporting the Kellogg Crossing

The applicant evaluated the potential river crossing options using Geographic Information Systems (GIS) and on-site evaluations, agency consultation and stakeholder input. Factors that guided the crossing evaluation and selection process included:

- Non-proliferation
- Refuge & USFWS Concerns
- Engineering Challenges & Visual Impacts
- Substation Locations

The results of the applicant's evaluation are discussed here and summarized in Table 6.1.1.

Table 6.1-1 Factors supporting the Kellogg crossing

Factor	Kellogg	Winona	La Crescent
Use of Existing Corridors, Minnesota	No new corridor required	10 miles of new corridor required	15 miles new corridor required
Use of Existing Corridors, Wisconsin	Two feasible route options that follow existing transmission lines	Two feasible route options. One follows an existing transmission line and one follows property boundaries and roads	Route options may not be feasible due to potentially unpermittable wetland impacts and/or displacement of businesses
Length in Floodplain	1.4 miles	3.25 miles	2 miles
Existing ROW in Refuge	180 feet	100 feet	100 feet
USFWS Opinion	Preferred	Opposed	Alternative with additional permitting constraints
Engineering Considerations	Narrowest river crossing; Route follows existing transmission corridor through blufflands; Wider ROW through refuge property allows flexibility to design lower structures to mitigate potential impacts to birds and aesthetics	Widest river crossing, requiring multiple poles to be located in Mississippi River backwaters; New corridor required in blufflands, limited access; Narrow ROW through refuge property results in tall structures causing potential impacts to birds and aesthetics	New corridor required in blufflands, limited access; Narrow ROW through refuge property results in tall structures causing potential impacts to birds and aesthetics
Feasible Substation Locations	Three potential substation sites	Three potential substation sites	La Crosse Substation not feasible; other alternatives require business displacement or an upgraded line in the La Crosse Marsh

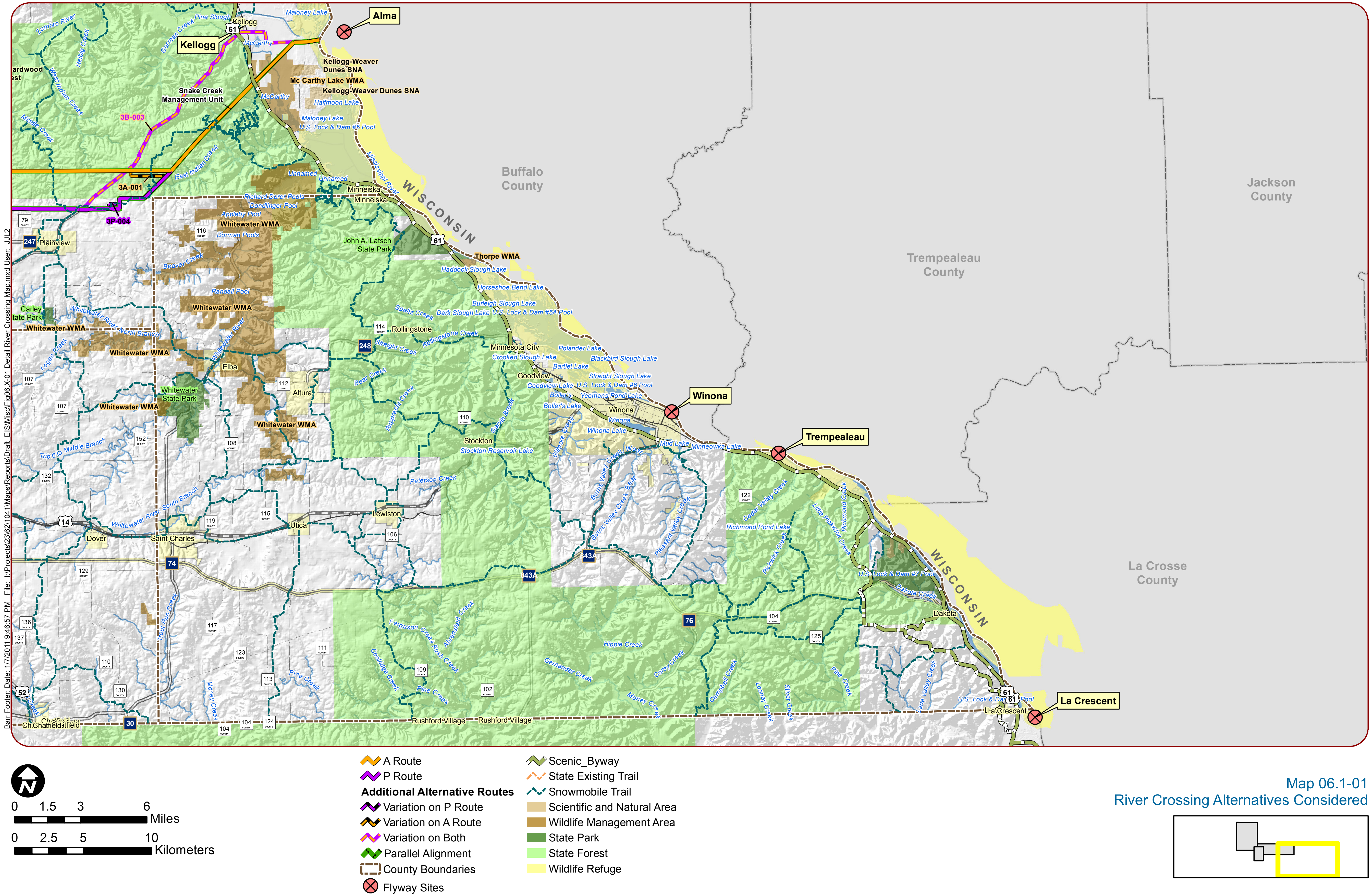
Minnesota Power Plant Siting Act

The Power Plant Siting Act (PPSA) directs the Public Utilities Commission (PUC) to locate transmission lines in a manner that "minimize[s] adverse human and environmental impact while ensuring continuing electric power system reliability and integrity and ensuring that electric energy needs are met and fulfilled in an orderly and timely fashion" (Minn. Stat. § 216E.02, subd.1). In furtherance of this objective, the PPSA and the PUC's implementing routing rules call upon the PUC to consider the utilization of existing transmission corridors in selecting transmission line routes (Minn. Stat. § 216E.03, subd.7.).

At the Kellogg crossing there is an existing 161 kV transmission line crossing the Mississippi river, with existing transmission line facilities on both sides of the river and through USFWS wildlife refuge property. The Kellogg crossing is the only crossing of those evaluated that follows an existing transmission line corridor through the blufflands in Minnesota. The Kellogg crossing then follows the 161/69 kV line corridor through the Upper Mississippi Wildlife and Fish Refuge. On the Wisconsin side, opportunities exist to follow existing transmission lines to the south to La Crosse (Dairyland Q-1 line), or to the east along a 161 kV corridor to Arcadia, and then south along an existing 69 kV line into the Galesville area. For the Kellogg Crossing, no new corridor would need to be created near or across the Mississippi River.

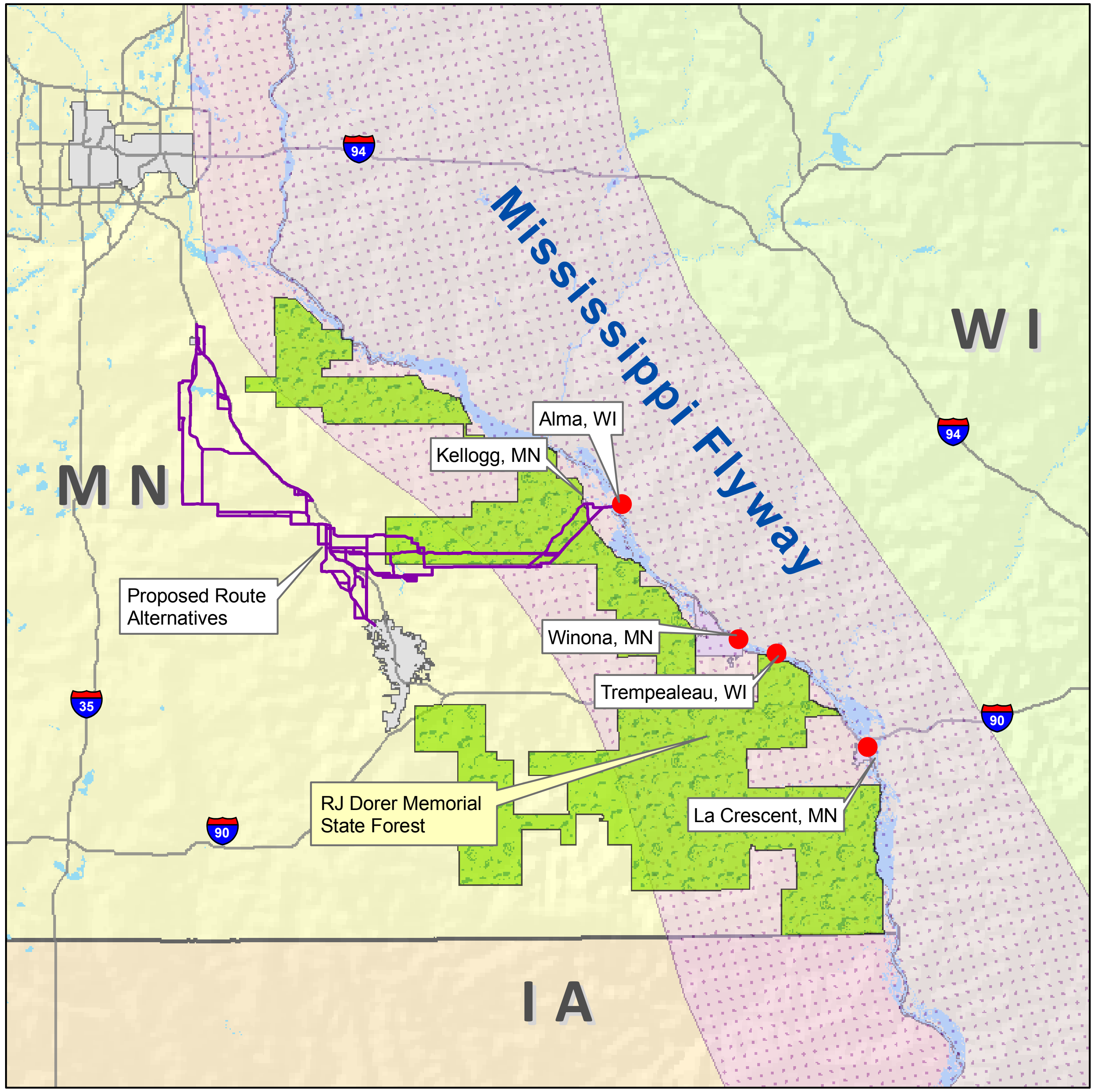
Refuge and USFWS Concerns

All potential crossings of the Mississippi River would affect USFWS-managed lands. There are two USFWS-managed lands potentially affected. The larger USFWS-managed property is the Upper Mississippi River National Fish and Wildlife Refuge (Refuge) which provides both recreational opportunities and habitat protection. The Refuge provides habitat for fish, mammals, amphibians, and reptiles. Moreover, it is located along a portion of the Mississippi Flyway, one of the four primary bird migration routes in North



Map 06.1-01
River Crossing Alternatives Considered

Figure 6.1-1 Project area showing approximate path of the Mississippi Flyway relative to the Kellogg crossing and the three other crossing alternatives considered



Source: Barr 2010 and Birdnature 1998

America (Figure 6.1-1). Trempealeau National Wildlife Refuge is smaller and located east of Winona, Minnesota.

Potential impacts to Refuge property include additional clearing that may be required through forested areas, potential bird impacts, aesthetic impacts, wetland impacts and temporary construction impacts. The length of the crossing and the height of structures are important considerations related to potential bird impacts. These impacts can be minimized by using the narrowest river and floodplain crossing area. Of the river crossings evaluated, the Kellogg crossing is located where the fewest miles of floodplain/Refuge (1.4 miles) would be crossed.

Throughout the route development process, the applicant sought input from USFWS regarding the crossings being considered. The USFWS is responsible for issuing a Special Use Permit for construction of a transmission line across Refuge property.

In a February 19, 2008, letter to the applicant, USFWS stated that the, "Alma (Kellogg) crossing may pose the least environmental impact." USFWS noted that no new right-of-way (ROW) may be required on Refuge property and that it "is also least likely to impact migratory birds since it is some distance from known bird concentration points." The USFWS also stated that neither the Winona nor the Trempealeau crossings should be considered. "[E]ach would likely involve new rights-of-way across portions of national wildlife refuges, and such ROW would likely not be approved since Service policy and regulations do not allow new uses that fragment habitat on refuges." With respect to the La Crescent crossing, USFWS stated it was the "second choice," but that the option presents concerns "due to its proximity to an active eagle nest and great blue heron colony approximately 0.3 mile north (Wisconsin side) and an important heron and egret feeding area adjacent to the line (Minnesota side)" (USFWS 2008).

Engineering Challenges and Visual Impacts

Crossing the Mississippi River channel and floodplain poses a unique engineering challenge because the river has a minimum clearance of approximately 90 feet that must be maintained for navigational purposes. Backchannels, wetlands and islands also are present at the crossings. The channel would require a long span. These factors may necessitate structures at the river crossing that are taller than the typical height of 150 feet. Federal Aviation Administration (FAA) regulations require structures exceeding 200 feet in height to have lights and/or be painted red and white to increase structure visibility. Structure heights of less than 200 feet are generally desired because lights on tall structures are known to have the potential to increase bird impacts, and painted structures would have greater visual impacts.

Of the river crossings evaluated, the Kellogg crossing has the widest existing ROW (180 feet) for a transmission line crossing the river. This width enables shorter river-crossing transmission structures. This width provides flexibility to work with the USFWS in developing appropriate structures to meet engineering requirements and to minimize bird and visual impacts.

Substation Locations

The 345 kV transmission line of the Hampton – Rochester – La Crosse project is proposed to terminate at an existing or new substation in the La Crosse, Wisconsin area. The Kellogg crossing provides flexibility in substation siting in the La Crosse area equal to or better than other river crossings evaluated. The applicant has identified three potential substation sites that could be used with the Kellogg crossing: (1) at or near the existing North La Crosse Substation, (2) at a new substation near Galesville, or (3) at a new substation near Holmen.

Factors Supporting the Kellogg Crossing

- Only option with no new corridor required through Minnesota blufflands
- Two options for following existing transmission lines in Wisconsin
- Shortest traverse through floodplains
- Preferred option of the USFWS
- Widest existing ROW within wildlife refuges
- Narrowest Mississippi River crossing
- Flexibility in selecting potential substation sites

6.2 The Mississippi River at Kellogg

Most of the route alternatives approaching the Kellogg crossing would follow the existing Dairyland Q-3 line corridor that traverses the blufflands west of the Mississippi River (part of the geologic formation known as the "Driftless Area"), and several state and federal lands including the Snake Creek Management Area, McCarthy Lake Wildlife Management Area (WMA), and the Richard J. Dorer Memorial Hardwood State Forest (RJD State Forest). These resources are discussed in detail in Sections 8.3.4.7 and 8.4. Three route alternatives would not cross the McCarthy Lake WMA. These are route alternatives 3P-Kellogg, 3A-Kellogg and 3B-003. Route alternatives 3P-Kellogg and 3A-Kellogg would parallel the Canadian Pacific Railroad along the east side of US-61, beginning approximately 2.6 miles south of Kellogg. They would continue north approximately two miles, then turn east following road and property lines to the point where all route alternatives converge for the Kellogg crossing. Route alternative 3B-003 would follow Wabasha County Hwy 42 from near North County Road 14 northeast US-61 south of Kellogg. Approximately 0.5 mile after crossing US-61, route alternative 3B-003 would join route alternatives 3P-Kellogg and 3A-Kellogg, continuing east to the convergence with all other routes.

The Kellogg crossing area begins approximately 3.2 miles east-southeast of Kellogg, MN. All route alternatives converge near this point to follow the existing Dairyland Q-3 161 kV transmission line corridor toward the river crossing. At this point, the Dairyland Q-3 line is collocated with the Alma-Harmony 69 kV transmission line. The USFWS-authorized ROW is 180 feet for these facilities. The total width of the river floodplain crossed by the transmission facilities is approximately 1.4 miles. Approximately 2200 feet (0.4 mile) of the floodplain crossed is on the Minnesota side. The transmission line crossing enters Refuge property at an abrupt transition from agricultural land to wooded floodplain forest. This floodplain forest extends approximately 1,300 feet to the Zumbro River channel. The Zumbro River occupies a 350-foot channel that is separated from the main Mississippi River by a 500-foot-wide wooded floodplain peninsula. The Mississippi River channel is approximately 1,400 feet wide at the Kellogg crossing. The Minnesota boundary of the Kellogg crossing ends mid-river. (See Figure 6.2-1)

Most of the land cover within the route at the Kellogg crossing site is floodplain forest or aquatic habitat, primarily associated with the Refuge. The Minnesota Department of Natural Resources (DNR) classifies the dominant vegetation type as "southern Minnesota floodplain forest (FFs68)" (DNR 2005). There is also agricultural land west of the Refuge boundary and the Kellogg crossing.

There is a total of approximately 64 acres of wetlands within the route width at the Kellogg crossing site. There are two recorded occurrences of state-listed species, and no documented occurrences of federally-listed species.

The Kellogg crossing is in a relatively remote, unpopulated area. As a result, other resources identified along the overall 345 kV transmission line route are not present. This includes:

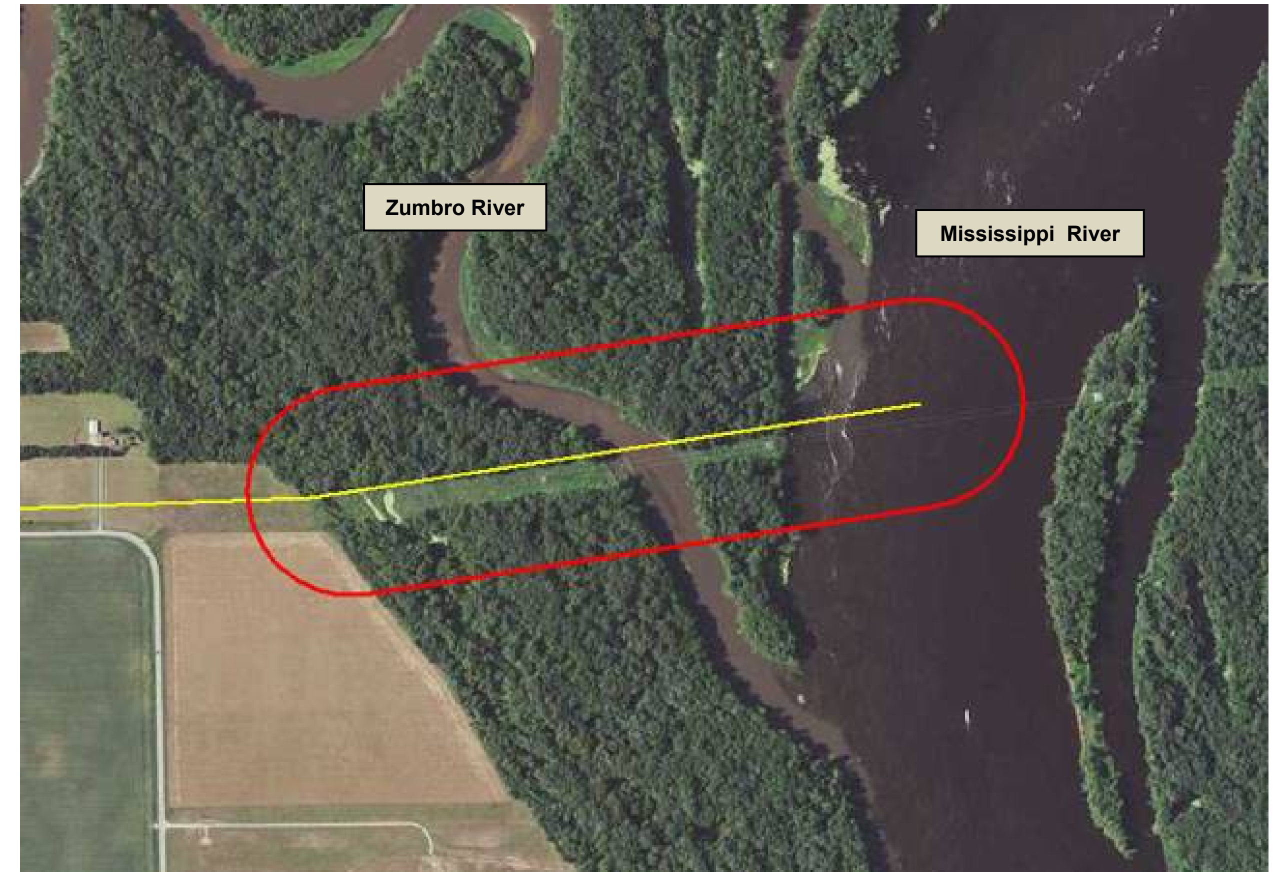
- residences, schools, hospitals, churches and cemeteries;
- land-based economic activities other than agriculture;
- lakes, trout streams, state conservation easements;
- recorded cultural resources;
- state, county or local parks, state forest lands, DNR or state park trials or boat accesses.

All resources present within the route at the Kellogg crossing site, as well as potential impacts to those resources, are discussed in detail in Section 8.4.

6.3 Crossing the Mississippi River at Kellogg

There are two ways for a transmission line to cross the Mississippi River at Kellogg – an aerial crossing or an underground crossing. These crossing options are discussed here; potential impacts and mitigations related to the aerial crossing options are detailed in Section 8.4.

Figure 6.2-1 Aerial photograph of Mississippi River at the proposed Kellogg crossing



The red oval shows the route width at the river crossing. Resources and potential impacts within that area are summarized here and detailed in Section 8.4.

Details provided in the applicant's route permit application on both aerial and underground crossings are provided in Appendix D.

6.3.1 Aerial River Crossing

An aerial crossing of the Mississippi River presents unique challenges that will require the use of multi-circuit specialty structures. An existing double-circuit transmission line crosses the Mississippi River and Refuge at the project's proposed crossing location. The existing line crosses approximately 0.5 mile of Refuge lands and includes two structures on Refuge property. The line is constructed on a 180-foot-wide permitted ROW. An area approximately 125 feet wide and 1,900 feet long is maintained cleared of trees. The two main existing river crossing structures are 180 feet tall.

An aerial crossing of the Mississippi River at Kellogg would require nine structures to carry the conductors. Four of these would be on the Minnesota side of the river, with the remainder on the Wisconsin side. Three of the four structures on the Minnesota side would be on Refuge property, and one would be on private property. The two structures closest to the river on either side must be at least 195 feet tall in order to span the approximately 1600-foot river width and maintain the 90-foot minimum conductor clearance above the river required by the US Army Corps of Engineers (USACE). The heights of the remaining structures are determined by the height of the two central structures.

The applicant has coordinated with USFWS to evaluate five different options for configurations of structures and lines for the proposed 345 kV transmission line in order to determine which option would minimize avian collisions. The five options vary in height of structures, width of cleared ROW, and number of horizontal planes in which the conductors are strung. Therefore, depending on the option selected for erecting and configuring structures to carry the 345 kV and 161 kV transmission lines, additional clearing of the ROW may be required. The five options are diagrammed in Section 8.4, Figures 8.4.1-2 through 8.4.1-6.

A Special Use Permit from the USFWS will be required to cross the Refuge. Other impacts associated with the five aerial crossing options include clearing of additional ROW and the effect of clearing on existing vegetation and wildlife use of the area. These impacts are also discussed in detail in Section 8.4.

6.3.2 Underground River Crossing

Another possible alternative for crossing the Refuge and Mississippi River is to use an underground conduit and cable system. The applicant engaged an engineering firm to determine the feasibility of underground installation for the double circuit 345 kV line at the Kellogg river crossing.

Underground transmission cable, especially at high voltages such as 345 kV, is much different than underground distribution cable. Transmission cables are several inches in diameter and must be contained in 10 to 30-inch pipes. Multiple conductors per phase are required. When open trench methods place the conductors close to the surface, they must be encased in concrete or steel to protect them from potential damage.

The applicant considered two alternatives for underground installation of the transmission line. These are referred to as "extruded dielectric cable system" (XLPE) and "high-pressure fluid-filled pipe" (HPFF).

XLPE systems have the advantages of requiring low maintenance, high reliability at voltages of 230 kV and lower, higher allowable operating temperatures and easier repairs. Disadvantages include susceptibility to damage from excavations, limited use of the system at 345 kV, and technical issues that may reduce performance.

HPFF systems have the advantages of having a long experience record in the U.S., high reliability at higher voltages, steel casings that reduce damage from excavations, and shorter trench lengths during installation. Disadvantages include pipe susceptibility to corrosion, more difficult repair, higher maintenance needs and the need for specialized equipment and personnel for installation.

The applicant reviewed both XPLE and HPFF systems for cost, and found that the XPLE system would cost over twice as much as the HPFF system. As a result, the applicant's further analysis of the underground option included only the HPFF option.

Installing the proposed transmission line underground would require opening a series of trenches and establishing a work area alongside the alignment to avoid unintentional excavation damage. In this instance, the underground alternative results in a 235' wide cleared ROW containing eight 10-inch borings under the river spaced 25 feet apart. Map 6.3.2-1 shows the layout and ROW needs for the HPFF system.

In addition, the underground design would require transition stations. Similar to small fenced substations, a transition station is required at each end to transition from underground to overhead cable. Each transition station would be approximately one acre in size.

Whereas the Mississippi River and associated wetlands can be spanned by aerial transmission lines, an underground installation would require directional drilling under these resources. Where directional drilling is not feasible (potentially in some wetland areas), trenching would be required.

As with aerial installations, cleared ROW over an underground installation must be kept free of trees and other vegetation with deep woody roots. Both underground and aerial installation of transmission lines may require long-term vegetation control in the ROW.

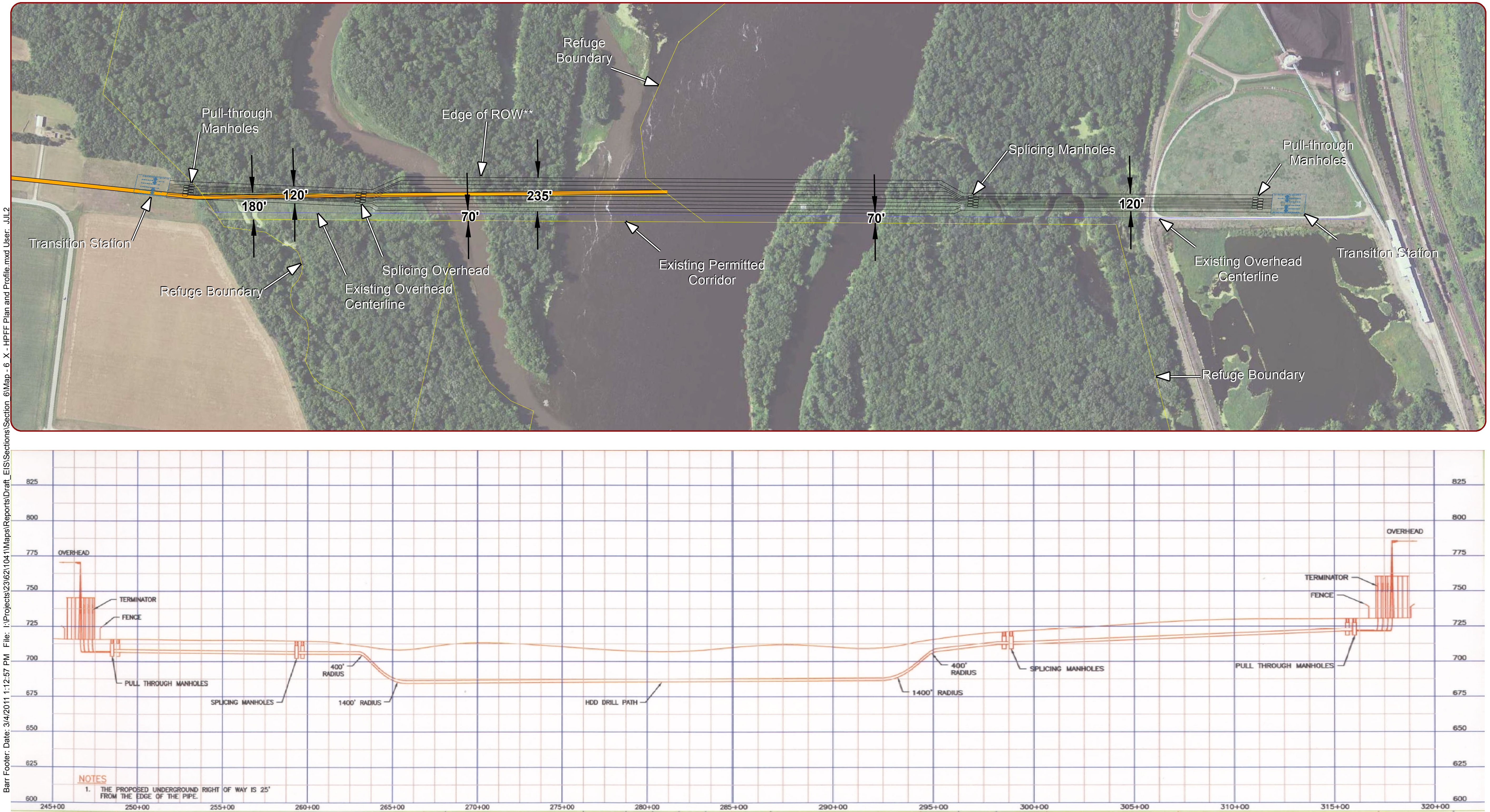
In general, aesthetic impacts and the risk of bird impacts can be reduced with underground construction. However, with the underground alternative studied, the existing double circuit 161 kV overhead line at the Kellogg Crossing would remain in place. Thus, the potential for avian impacts due to the existing line would remain.

Underground construction would involve more ground disturbance during construction than overhead alternatives due to the need to construct with horizontal directional drill and open trench methods. Temporary construction areas would require additional tree clearing. High pressure fluid-filled pipe technology contains a mineral oil dielectric coolant that, while manageable, is a potential environmental issue that is not present with overhead construction.

The underground alternative also has unique reliability concerns. Failures of underground cables take longer to locate and repair than overhead alternatives. Complete replacement of a span of cable, if necessary, could leave the transmission line out of service for several months.

The length of the underground alternative studied is 1.3 miles and has an estimated cost of $90 million. This is approximately $70 million per mile for underground double circuit 345 kV compared to approximately $2 million per mile for overhead.

Based on the engineer's analysis and the applicant's own experience, the applicant did not propose an underground crossing of the Mississippi River at Kellogg.



0 150 300 600 900 Feet

0 50 100 200 300 Meters

Proposed Crossing Route*

* All route alternatives follow the same crossing route
** The proposed underground right-of-way is 25' from the edge of the pipe

Map 6.3.2-01
Conceptual Underground Crossing Plan and Profile
High-Pressure Fluid-Filled Pipe (HPFF) Method